

REVISION OF *LOBELIA* SECT. *HOMOCHILUS* (CAMPANULACEAE: LOBELIOIDEAE)

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ABSTRACT

Lobelia L. sect. *Homochilus* A. DC. comprises six species, two of which are divided into pairs of geographic subspecies. All are robust polycarpic (iteroparous) perennial herbs or shrubs with relatively large more-or-less racemose flowers on ebracteolate or minutely bibracteolate pedicels; hemispheric or depressed hemispheric hypanthia; bilabiate or subbilabiate (unilabiate in one species) red, orange, yellow, pink, or purple-hued corollas with a straight cylindrical or apically tapering tube equaling or longer than the monomorphic lobes; ventral anthers with tufts of white or yellow trichomes at apex; and oblong or ellipsoid seeds with a faintly striate or minutely reticulate testa (Murata Type D); the three taxa that have been studied cytologically are diploid with $n = 7$. *Lobelia aguana*, *L. ghiesbreghtii*, *L. guerrerrensis*, and *L. laxiflora* have pedicels longer than the red, orange, or yellow typically bicolored flowers, and are distributed primarily in Mexico and/or Central America; *L. decurrens* and *L. heteroclita*, in contrast, have pedicels shorter than the monochromatic pink or purple-hued flowers, and are confined to the Andes of South America.

RESUMEN

Lobelia L. sect. *Homochilus* A. DC. comprende seis especies, dos de las cuales están divididas en pares de subespecies geográficas. Todas son hierbas perennes robustas policárpicas o arbustos con flores relativamente grandes más o menos racemosas sobre pedicelos ebracteolados o diminutamente bibracteolados; hipantos hemisféricos o hemisférico deprimidos; bilabiados o subbilabiados (unilabiados en una especie) corolas rojas, anaranjadas, amarillas, rosas, o tonos púrpura con un tubo cilíndrico o estrechado apicalmente tan largo o más que los lóbulos monomórficos; anteras ventrales con mechones apicales de tricomas blancos o amarillos; y semillas oblongas o elipsoides con una testa débilmente estriada o diminutamente reticulada (Murata Tipo D); los tres taxa que han sido estudiados citológicamente son diploides con $n = 7$. *Lobelia aguana*, *L. ghiesbreghtii*, *L. guerrerrensis*, y *L. laxiflora* tienen pedicelos más largos que las flores típicamente bicólores rojas, anaranjadas, o amarillas, y están distribuidas primariamente en México y/o América Central; *L. decurrens* y *L. heteroclita*, por contra, tiene pedicelos más cortos que las flores monocromáticas rosa o tonos púrpura, y están confinadas a los Andes de Sur América.

Lobelia L. is the largest of the 30 genera of Lobelioideae (Campanulaceae), comprising over 400 species of annual and perennial herbs, shrubs, trees, and giant rosette plants, with solitary or racemose (rarely paniculate or corymbose) flowers on bibracteolate pedicels; blue, purple-hued, or white (rarely red, pink, green, or yellow) corollas with the tube dorsally cleft to the base and the lobes monomorphic or dimorphic and the ventral larger; and apically bivalvate capsules or rarely berries (Lammers 1993, 2004; Murata 1995). The genus is virtually cosmopolitan in distribution, with representatives native to the floras of six conti-

nents and several major oceanic archipelagoes. Nearly 38% of the species are indigenous to Africa and another 29% to North America; Asia and Australasia each have about 10% of the species, South America 8%, and Polynesia 3%, while just two species occur in Europe (Lammers, unpublished data).

The last comprehensive monograph of *Lobelia* was that of Wimmer (1953, 1968), who divided its species among three subgenera: subg. *Lobelia* with two sections; subg. *Mezleria* (C. Presl) E. Wimm. (a name unfortunately referable to the genus *Monopsis* Salisb.; cf. Lammers 1999), with two sections; and subg. *Tupa* (G. Don) E. Wimm. with six sections. Further taxonomic structure was indicated by dividing many of the 10 sections into subsections and other subordinate taxa (cf. Lammers 1993). This classification was revised by Murata (1995), who maintained the three subgenera but altered their division into sections, recognizing a total of 14 and abandoning all subordinate taxa.

Among the six sections of subg. *Tupa* recognized by Murata (1995) was sect. *Homochilus* A. DC. Wimmer (1953, 1968) had circumscribed this section to include six species of perennial herbs and shrubs distributed from the southwestern United States to Peru. These species were characterized by their large racemose flowers with a hemispheric hypanthium, bilabiate or subbilabiate red, orange, yellow, or purple corolla with a straight cylindrical tube equaling or longer than the monomorphic lobes; ventral anthers bearded apically with tufts of white trichomes; and faintly striate oblong or ellipsoid seeds (Type D of Murata 1992, 1995).

Although Murata (1995) accepted Wimmer's (1953, 1968) treatment of sect. *Homochilus*, a preliminary study of some of its members (Eakes & Lammers 1996; cf. Hamlin 1995; Lammers 1999) suggested that neither this classification nor that of McVaugh (1943) was optimal, especially at the infraspecific level. Furthermore, since these treatments were published, two additional species thought referable to the section have been described (McVaugh 1965; Lammers 1999). The purpose of the present study, then, was to re-evaluate taxonomic relationships in the section, particularly at the infraspecific level, and to promulgate a formal classification that would satisfactorily reflect these relationships.

TAXONOMIC HISTORY

The genus *Lobelia* was first divided into named subordinate taxa by Candolle (1839), who recognized three sections: unispecific sect. *Trimeris* (C. Presl) A. DC., sect. *Lobelia* [as "sect. Rapuntium," nom. invalid.] with the bulk of the species, and sect. *Homochilus* with six species. This last was characterized by flowers with a hemispheric hypanthium and a red, yellow, or purple bilabiate corolla with an elongate cylindrical tube almost equaling the lobes in length. As originally circumscribed, it was geographically heterogeneous. Its members were *L. decurrens* Cav. of "Chile" (actually Peru; see below), *L. laxiflora* Kunth and *L. rigidula* Kunth of Mexico, *L. kraussii* Graham of Dominica and Martinique in

the Lesser Antilles, *L. rotundifolia* Juss. ex A. DC. of Hispaniola and Puerto Rico in the Greater Antilles, and *L. gaudichaudii* A. DC. of O'ahu in the Hawaiian Islands.

Bentham (1876) expanded the circumscription of *Lobelia* by incorporating several genera that Candolle (1839) and others had recognized as distinct. In doing so, he retained Candolle's three sections and added five more: sect. *Tupa* (G. Don) Benth., sect. *Tylomium* (C. Presl) Benth., sect. *Rhynchoptalum* (Fresen.) Benth., sect. *Hemipogon* Benth., and sect. *Holopogon* Benth. As regards sect. *Homochilus*, Hawaiian *L. gaudichaudii* was explicitly removed to sect. *Rhynchoptalum*. Of the two West Indian species in the section, *L. rotundifolia* was removed, presumably to sect. *Tylomium*, but *L. kraussii* was implicitly left in sect. *Homochilus*. Schönland's (1889) classification of the genus was similar and his treatment of sect. *Homochilus* identical. The section was likewise recognized by Uphof (1910) and (under the generic name *Rapuntium* Mill.) by Post and Kuntze (1903).

In treating the North American representatives of sect. *Homochilus*, McVaugh (1943) recognized two additional species as members: *L. aguana* E. Wimm. and *L. griesbreghtii* Decne. West Indian *L. kraussii* was removed to sect. *Tylomium*, leaving only plants of the American mainland in sect. *Homochilus*. From his earlier comments (McVaugh 1940), it would appear that *L. decurrens* was also excluded from sect. *Homochilus* (and perhaps even from all of subg. *Tupa*; cf. McVaugh 1965). McVaugh divided *L. laxiflora* into four more-or-less geographic varieties, one of which encompassed *L. rigidula*.

Wimmer's (1953, 1968) treatment of these species was identical, with the following exceptions. *Lobelia decurrens* was definitely included within the section, and divided into two varieties. *Lobelia delessertiana* was segregated from *L. laxiflora* var. *laxiflora*, while *L. laxiflora* var. *nelsonii* was elevated to specific rank as *L. haenkeana* (C. Presl) A. DC. and divided into two varieties. What remained of *L. laxiflora* was then divided into six varieties plus 12 *formae*. This circumscription and classification of sect. *Homochilus* was accepted by Murata (1995).

MATERIALS AND METHODS

Revision of the classification of sect. *Homochilus* was based upon morphological data analyzed via traditional taxonomic methodology (Leenhouts 1968; Qualls 1986; Vogel 1987; Maxted 1992; Watson 1997; Winston 1999). These data were gathered from over 3400 specimens deposited in 38 herbaria (see Acknowledgments for a complete list of institutions); all extant types were seen, either as the original specimen or as a high-resolution image. Definitions of qualitative character states follow Harris and Harris (1994), supplemented by Radford (1986).

The classification promulgated here embodies a morphological species concept (Michener 1970; Cronquist 1978; Stuessy 1990), though it is assumed

that the species recognized are more or less equivalent to the biological species (Grant 1981) that would be recognized were data on reproductive behavior available. When it is possible on the basis of morphology to discern clusters of conspecific populations that are geographically coherent, such clusters are recognized as subspecies (cf. Raven et al. 1974; Thorne 1978; Lammers 1988, 1991, 1995, 1999; Thompson & Lammers 1997). It is understood that conspecific subspecies will not be as clearly demarcated as congeneric species, and may show some intergradation in their zone of contact.

Altogether, over the past two centuries, a total of 48 heterotypic names referable to sect. *Homochilus* have been published, together with an additional 45 homotypic synonyms. The protologues for all 93 names were examined. All nomenclature was brought into compliance with current provisions of the *International Code of Botanical Nomenclature* (ICBN; Greuter et al. 2000) and typification was clarified as necessary.

RESULTS AND DISCUSSION

Revising the classification of a genus or infrageneric taxon is essentially a two-stage process (Qualls 1986; Maxted 1992; Watson 1997). First, one must determine the appropriate circumscription of the taxon as a whole, i.e., what individuals and populations to include within it. Second, these constituent units must be divided into a number of subordinate taxa: species and perhaps subspecies.

Circumscription of the section.—A detailed evaluation of the circumscription of sect. *Homochilus* can only be performed in the context of a thorough re-examination of the classification of all 400+ species of *Lobelia*. Murata's (1995) attempts in that direction are probably the best that can be accomplished at the present time without molecular data or phylogenetic analysis. His classification of *Lobelia* is certainly more natural than that of Wimmer (1953, 1968), as it takes into account a larger assemblage of characters. For this reason, Murata's (1995) treatment is accepted here as an overall framework within which to work.

Murata's (1995) studies supported Wimmer's (1953, 1968) circumscription of sect. *Homochilus* and he explicitly accepted it in his revision. However, he did note that additional species might be assigned there. Murata did not study in any detail the Central American and West Indian species treated by Wimmer (1953, 1968) as "species antillanae" within sect. *Tupa* (as sect. *Eutupa* E. Wimm., nom. illeg. sub Art. 52.1) but did comment that they "may be attributable" to sect. *Homochilus* rather than sect. *Tupa*. These species (e.g., *L. assurgens* L., *L. cirsiifolia* Lam., *L. nubicola* McVaugh) do indeed differ from members of sect. *Tupa* as circumscribed by Murata (1995) and Lammers (2000) in their conspicuously bibracteolate (vs. ebracteolate or minutely bibracteolate) pedicels; globose or ovoid seeds with a reticulate testa (Murata Type E) (vs. oblong or ellipsoid with a faintly striate or minutely reticulate testa [Murata Type D]), and diploid (vs. hexaploid) chromosome number. Furthermore, Wimmer's "species

antillanae" do indeed resemble sect. *Homochilus* in certain features, including their robust habit; relatively large flowers with red, orange, yellow, pink, or purple-hued corolla; and diploid chromosome number (so far as known; Lammers 1993).

However, these "species antillanae" also differ from sect. *Homochilus* in several important characters. First, their bracteoles are conspicuous and foliaceous (vs. absent or minute in sect. *Homochilus*). Second, the corolla tube is curved or arcuate (vs. straight) with the lobes often unilabiate and deflexed (vs. usually bilabiate or subbilabiate and recurved or straight). Finally and perhaps most significantly, the seeds are ovoid or globose, with a reticulate testa of Murata Type E (vs. oblong or ellipsoid with a faintly striate or minutely reticulate testa of Murata Type D). After weighing all the data, it seems best to exclude Wimmer's "species antillanae" from both sect. *Tupa* and sect. *Homochilus*; they are here recognized as sect. *Tylomium*, following McVaugh (1940, 1943) and other recent authors (e.g., Wilbur 1991; Lammers & Proctor 1994; Buss et al. 2001).

In her detailed account of *Heterotoma* Zucc., Ayers (1986, 1990) mentioned that, on the basis of her very preliminary cladistic analyses, the type of that genus, *H. lobelioides* Zucc., might logically be included within *Lobelia* sect. *Homochilus*. This species does resemble members of sect. *Homochilus* in a number of features, including its robust polycarpic habit; suffruticose stems; racemose inflorescence; ebracteolate pedicels; relatively large flowers with red or orange and yellow bicolored corolla; ventral anthers bearded apically with tufts of white trichomes; faintly striate (Murata Type D) seeds; and diploid chromosome number (Lammers 1993). However, *H. lobelioides* differs conspicuously from any species of *Lobelia* (and is unique among Campanulaceae) in its large arcuate basally inflated nectar spur and in the nearly perpendicular exertion of the staminal column from the corolla tube during the carpellate phase of the flower (Ayers 1986, 1990). In light of this and the preliminary nature of her cladograms, it is best to follow Ayers' (1986, 1990) recommendation and recognize *H. lobelioides* as the sole species of a distinct genus.

Although *L. decurrens* was included in sect. *Homochilus* from the very beginning, McVaugh (1940) implied that it should be excluded from that section (and perhaps even from the entire subgenus; cf. McVaugh 1965). It does indeed differ from the species included there by McVaugh (1940, 1943) in a number of features, including its rank odor; decurrent leaves; pedicels shorter than (vs. equaling or longer than) the flowers, making the inflorescence appear spike-like (vs. clearly racemose); fimbriate (vs. entire or minutely toothed) calyx lobes; and monochromatic purple-hued (vs. red, orange, or yellow and usually bicolored) corollas. However, *L. decurrens* does resemble the other species of sect. *Homochilus* in its robust polycarpic habit, ebracteolate pedicels, depressed hemispheric hypanthium, straight cylindrical or slightly tapering corolla tube, monomorphic corolla lobes, faintly striate (Murata Type D) seeds, and diploid

chromosome number (Lammers 1993). Though it is somewhat discordant in sect. *Homochilus*, it would be even more so in the other sections of subg. *Tupa*, e.g. sect. *Colensoa* (Hook. f.) J. Murata, sect. *Tupa*, or sect. *Tylomium*. For these reasons, *L. decurrens* is assigned to sect. *Homochilus*.

In naming and describing *L. heteroclita*, McVaugh (1965) did not assign his new species to a specific section, merely commenting that it was "apparently referable to the subgenus *Tupa* as delimited by Wimmer." It differs from all other species assigned here to sect. *Homochilus* in its ventrally oblique hypanthium (cf. Ayers 1990) and deep pink unilabiate corolla with a tube that tapers conspicuously towards the mouth. However, it resembles the rest of the section in its robust habit, reduced or absent bracteoles, depressed hemispheric hypanthium, straight corolla tube, and monomorphic corolla lobes. It particularly resembles *L. decurrens*, the only other exclusively South American member of the section, in having pedicels shorter than the flowers, making the inflorescence appear spike-like, and in its monochromatic corollas. As with *L. decurrens*, it is even more discordant in any other section of subg. *Tupa*. It seems best assigned here, and regarded as related most closely to *L. decurrens*.

The newest member of the section, *L. guerrensis*, was explicitly assigned to sect. *Homochilus* by its authors (Lammers 1999). The degree to which it conforms to that section's characterization is indicated by the fact that all the specimens upon which it was based had previously been identified as *L. laxiflora*, the type of the section.

Species and subspecies.—After a thorough comparative study of all material, it was concluded that just six species could be recognized in sect. *Homochilus*. These are essentially the species assigned to the section by Wimmer (1953, 1968), except that *L. delessertiana* and *L. haenkeana* are subsumed into *L. laxiflora*, and two species described after Wimmer's death are added.

Two of these species exhibit relatively minor variation in morphology that is correlated with geography, making possible the recognition of subspecies. In *L. laxiflora*, the morphometric analysis of Eakes and Lammers (1996) supported the recognition of two subspecies based on leaf dimensions rather than the complex infraspecific classifications of McVaugh (1943) or Wimmer (1953, 1968). Plants of northeastern Mexico and Arizona have very narrow leaves, while those in the rest of the range are wider. This treatment, which is essentially identical to that of Candolle (1839), was implemented by Lammers (1999) and is maintained here. In *L. decurrens*, variation in flower size supports recognition of two subspecies, which differ from the two varieties recognized on the basis of pubescence by Wimmer (1937, 1953). Plants in the northern portion of the range have markedly smaller flowers than those in the south.

Summary.—The circumscription of sect. *Homochilus* adopted here encompasses six species, which fall into two subordinate groups, based on morphology and geography; because of the few species involved, these subgroups are

not named formally. The first group (*L. aguana*, *L. ghiesbreghtii*, *L. guerrensis*, and *L. laxiflora*) comprises species distributed primarily in Mexico and Central America (*L. laxiflora* extends into southern Arizona and southwestern Colombia), with pedicels longer than the typically bicolored red, orange, or yellow flowers. The second group (*L. decurrens* and *L. heteroclita*) encompasses species of the Andes of northern South America with pedicels shorter than the monochromatic pink or purple-hued flowers. One species in each group (*L. decurrens* and *L. laxiflora*) shows geographically correlated variation in morphology and is divided into a pair of subspecies.

TAXONOMIC TREATMENT

Lobelia sect. **Homochilus** A. DC. in DC., Prodr. 7:383. 1839. *Rapuntium* sect. *Homochilus* (A. DC.) Kuntze in T. Post & Kuntze, Lex. Gen. Phan. 479. 1903. TYPE (designated by Murata 1995): *L. laxiflora* Kunth.

Robust polycarpic (iteroparous) perennial herbs and shrubs. Stems 0.2-3 m tall, herbaceous, suffruticose, or woody, single or several from the base, branched or unbranched, erect or ascending, moderately to densely leafy, glabrous or pubescent; latex white or cream-colored, viscous. Leaves alternate, simple, exstipulate, sessile or petiolate, glabrous or pubescent, the lower ones of ten deciduous; lamina ovate, oblong, narrowly oblong, elliptic, narrowly elliptic, lanceolate, oblanceolate, or linear, chartaceous, flat (cernuous in *L. guerrensis*); margin entire, denticulate, serrulate, serrate, biserrate, or crenate, plane (minutely revolute in *L. guerrensis*); apex obtuse, acute, acuminate, or narrowly acuminate; base attenuate, cuneate, obtuse, rounded, or decurrent. Flowers tetracyclic, perfect and proterandrous, zygomorphic, epigynous, pedicellate and resupinate, relatively large and numerous, solitary in the axils of the upper leaves or these reduced gradually to bracts towards the apex and so forming a terminal raceme (the distinction not always clear); pedicels erect, ascending, spreading, or incurved, stiff or flexuous, glabrous or pubescent, ebracteolate or minutely bibracteolate; bracteoles (when present) subulate or linear. Calyx synsepalous; tube adnate to the ovary, forming a hemispheric or depressed hemispheric hypanthium, the base rounded or truncate (ventrally oblique in *L. heteroclita*), glabrous or pubescent; lobes 5, valvate, persistent, subulate, linear triangular, narrowly triangular, or triangular, shorter than the corolla tube, glabrous or pubescent, the margin entire, toothed, or fimbriate, the apex acuminate. Corolla sympetalous, zygomorphic, bilabiate or subbilabiate (unilabiate in *L. heteroclita*), red, orange, or yellow and the lobes often a different color than the tube, or pink or various shades of purple throughout, glabrous or pubescent; tube straight, cylindrical or tapering towards the mouth, laterally fenestrate towards base, dorsally cleft nearly to base; lobes 5, valvate, monomorphic; the two dorsal lobes linear or narrowly triangular, recurved or straight (all deflexed in *L. heteroclita*), one-fourth as long to about as long as the tube, acuminate or

acute at apex; the three ventral lobes forming a trifid lip, the segments narrowly triangular, slightly shorter than the dorsal, straight or slightly deflexed. Stamens 5, antiseptalous, connate for most of their length, exerted, emerging from the corolla above the dorsal lobes, glabrous or pubescent; dorsal anthers longer than the ventral, overhanging the orifice of the tube and partly occluding it; ventral anthers with tufts of white or yellow trichomes at apex; pollen tricolporate, prolate, ellipsoid. Ovary 2-loculed, inferior, adnate to the hypanthium for 1/3-2/3 its length; placentae large, axile; ovules numerous; style 1, slender, terete, with a ring of stiff white hairs near the apex; stigma 2-lobed, the lobes appressed and non-receptive as the style grows through the anther tube, pushing out pollen, after which the stigmas spread and become receptive. Fruit an ovoid or broadly ovoid capsule, 1/3-3/4-inferior, the conical apex dehiscent as two triangular valves; seeds honey-colored, oblong or ellipsoid, compressed, relatively small, the testa faintly striate or minutely reticulate (Type D of Murata 1992). Chromosome number (three taxa known) $n = 7$ (Lammers 1993).

Pollination biology.—Based on floral morphology, it is assumed that the species of sect. *Homochilus* are pollinated by hummingbirds. This assumption of ornithophily is supported for *L. laxiflora* by notes on herbarium labels (e.g., Bye et al. 9192, ASU, TEX; Hurd 6, MICH; Marshall 133, ARIZ, RSA) and by a published photograph (Anonymous 2003). In the bicolorous species, the corolla may change color to varying degrees through the course of anthesis. Typically, the corolla is more uniformly yellowish or orangish in bud or in staminate phase; the red pigments become best developed (and thus contrast reaches its peak) during carpellate phase. This phenomenon has also been observed in *L. excelsa* Bonpl. of sect. *Tupa* (Lammers 2000). The biological significance of such changes has been described by Weiss (1995).

KEY TO THE SPECIES AND SUBSPECIES

1. Pedicels shorter than the flowers, the inflorescence appearing spike-like; corolla monochromatic, various shades of purple (violet, red-purple, magenta, mauve, lavender) or deep pink (South America).
2. Leaves rounded or cuneate at base; pedicels 15–23 mm long; hypanthium oblique ventrally; calyx lobes entire or with 1–2 minute denticulations per side; corolla tube 29–38 mm long, tapering conspicuously to mouth; corolla lobes 1/4–1/3 as long as tube, all five forming a single ventral lip; filament tube 32–38 mm long; dorsal anthers 4–5 mm long, 1/8–1/7 as long as filament tube (Colombia)

6. *L. heteroclita*

2. Leaves long decurrent at base; pedicels 5–14 mm long; hypanthium symmetrical; calyx lobes fimbriate with 3–9 teeth per side; corolla tube 14–30 mm long, cylindrical or tapering slightly towards mouth; corolla lobes 1/3–9/10 as long as tube, two dorsal and three ventral; filament tube 20–33 mm long; dorsal anthers 6–8.5 mm long, 1/4–1/3 as long as filament tube.
3. Corolla 31–42 mm long, the tube 20–30 mm long, 2.5–3 times longer than the dorsal lobes; filament tube 24–33 mm long, 3.4–4.2 times longer than the dorsal anthers (5 Peru) _____ **5a. *L. decurrens* subsp. *decurrens***

3. Corolla 22–33 mm long, the tube 14–19 mm long, a little longer than the lobes to 1.8 times longer; filament tube 20–26 mm long, 2.5–3.6 times longer than the dorsal anthers (N Peru) _____ **5b. *L. decurrens* subsp. *parviflora***
1. Pedicels equaling or longer than the flowers, the inflorescence clearly racemose; corolla usually bicolorous, red, orange, and/or yellow (Mexico and Central America primarily).
3. Stems, flowers, and ventral surface of lamina white-tomentose; lamina broadest at or near middle, 3.5–8 cm wide, on a petiole 10–30 mm long (Oaxaca) _____ **4. *L. ghiesbreghtii***
3. Stems, flowers, and ventral surface of lamina glabrous or pubescent, but never white-tomentose; lamina usually broadest below middle, 0.2–5 cm wide, sessile or on a petiole up to 7 mm long.
4. Pedicels 85–210 mm long; calyx lobes 6–18 mm long; dorsal corolla lobes 20–33 mm long, the ventral 18–26 mm long; dorsal anthers 9–12 mm long, the ventral 7.5–9.5 mm long; capsules 10–15 mm long; seeds minutely reticulate (Guerrero to Guatemala) _____ **3. *L. aguana***
4. Pedicels 20–130 mm long; calyx lobes 1–6 mm long; dorsal corolla lobes 10–22 mm long, the ventral 10–21 mm long; dorsal anthers 6–9 mm long, the ventral 4.5–7.6 mm long; capsules 6–12 mm long; seeds faintly striate.
5. Lamina cernuous, the margin entire or nearly so and minutely revolute; corolla yellow or yellowish orange on tube, red or orange on lobes; anther tube with dense dirty yellow trichomes 2–4 mm long from apex to base; ventral anthers with a tuft of dirty yellow trichomes 1.5–2 mm long at apex; capsules 9–11 mm in diameter; seeds 0.7–0.8 mm long, 0.3–0.4 mm wide (Guerrero) _____ **2. *L. guerrerensis***
5. Lamina flat, the margin denticulate, serrulate, serrate, or doubly serrate and plane; corolla red or orange on tube, orange or yellow on lobes; anther tube with sparse to moderately dense white trichomes 0.5–1 mm long on dorsal surface towards apex; ventral anthers with a tuft of white trichomes 0.7–1.3 mm long at apex; capsules 7–9 mm in diameter; seeds 0.5–0.6 mm long, 0.2–0.3 mm wide.
6. Lamina 1–5 cm wide, 2–8 times longer than wide, the base rounded, obtuse, or cuneate (Mexico to Colombia) _____ **1a. *L. laxiflora* subsp. *laxiflora***
6. Lamina 0.2–1.4 cm wide, 12–18 times longer than wide, the base attenuate (Arizona & NE Mexico) _____ **1b. *L. laxiflora* subsp. *angustifolia***

1. *Lobelia laxiflora* Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 3:311 (quarto), 242 (folio), 1819 (Nov). *Rapuntium laxiflorum* (Kunth) C. Presl, Prodr. Monogr. Lobel. 26. 1836. *Tupa laxiflora* (Kunth) Planch. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1857:154. 1857. *Lobelia persicifolia* var. *laxiflora* (Kunth) Vatke, Linnaea 38:723. 1874. *Dortmanna laxiflora* (Kunth) Kuntze, Revis. Gen. Pl. 972. 1891. TYPE: MEXICO. [GUERRERO:] Acaguistota, Humboldt 3918 (HOLOTYPE: P-Bonpl. [IDC-microfiche]; photographs: F! MICH!); ISOTYPES: B! [photographs: F! MICH!] B-W [IDC-microfiche!]. The isotype at B-W is the holotype of *L. fissa*. Though it seems that the name *L. persicifolia* var. *laxiflora* was used for the nomenclaturally typical "α" variety, neither the type of *L. persicifolia* (see below) nor the name itself was cited; the name thus is validly published under Art. 26.2.

Stems 0.2–3 m tall, herbaceous, suffruticose, or woody, unbranched or sparingly branched, erect or ascending, glabrous or pubescent. Leaves sessile or petiolate; lamina ovate, lanceolate, oblong, elliptic, narrowly elliptic, lanceolate, or lin-

ear, 2.5–19 cm long, 0.2–5 cm wide; adaxial surface glabrous or sparsely pubescent; abaxial surface glabrous or pubescent; margin denticulate, serrulate, serrate, or doubly serrate; apex acuminate or acute; base attenuate, cuneate, obtuse, or rounded; petiole (when present) 1–7 mm long, glabrous or pubescent. Flowers solitary in the axils of the upper leaves or forming a terminal raceme; pedicels 20–100 mm long, erect, ascending, spreading, or incurved, stiff or flexuous, glabrous or pubescent, ebracteolate or bibracteolate at or below the middle; bracteoles (when present) linear, 0.5–1.1 mm long. Hypanthium depressed hemispheric, 2–5 mm long, 4–11 mm in diameter; glabrous or pubescent; base rounded or truncate. Calyx lobes subulate, linear triangular, narrowly triangular, or triangular, 1–6 mm long, 0.8–3 mm wide, glabrous or pubescent; margin entire. Corolla bilabiate or subbilabiate, red or orange on tube, grading to orange or yellow on the lobes (rarely all yellow), 24–40 mm long, glabrous or pubescent; tube 14–25 mm long, 4–9.5 mm in diameter at base, 3.5–7 mm in diameter at mouth, cylindric or tapering slightly towards mouth; dorsal lobes linear, 10–22 mm long, 1–2 mm wide, recurved or straight, half as long to about as long as the tube, acuminate or acute at apex; ventral lip 10–20 mm long, the segments triangular or narrowly triangular, 1–10 mm long, 0.5–2 mm wide, acute or acuminate at apex. Filament tube 18–34 mm long, 0.7–2 mm in diameter; reddish or yellowish, glabrous or pubescent; anther tube 1.5–3.9 mm in diameter, the dorsal surface towards the apex moderately to densely pubescent with white trichomes 0.5–1 mm long; dorsal anthers 6–9 mm long; ventral anthers 4.5–7.5 mm long, with tufts of white trichomes 0.7–1.3 mm long at apex. Capsules broadly ovate, 6–12 mm long, 7–9 mm in diameter; seeds oblong or ellipsoid, 0.5–0.6 mm long, 0.2–0.3 mm wide, ca. 0.1 mm thick, the testa faintly striate. Chromosome number $n = 7$ (Ayers 1986).

Distribution.—Found throughout much of Mexico, south through Central America to Panama, and in the Cordillera Occidental of southwestern Colombia, with one population in the southwestern United States, in southern Arizona. The inclusion of the West Indies and Peru within the species' range (Nash 1976; Ayers 2000) was erroneous, as was its attribution to Georgia in the southeastern United States (Don 1838; Knowles & Westcott 1838). Its presence in northern Ecuador, while expected (Jeppesen 1981; Jørgensen 1999), is as yet unsubstantiated.

Cultivation.—The species was introduced to horticulture in 1825 as a half-hardy perennial and is still cultivated today, though not commonly (Hooker 1837; Don 1838; Vatke 1874; Siebert & Voss 1894; Anonymous 1915; Thomas 1990; Lancaster 1991; Huxley 1992; Ayers 2000); it appears that most plants cultivated today represent subsp. *angustifolia* (A. DC.) Eakes & Lammers (see below).

Discussion.—This widespread species shows considerable variation throughout its geographic range in leaf dimensions, pubescence, pedicel posture, and other features. Candolle (1839) was the first to use this variation to

divide *L. laxiflora* into infraspecific taxa, recognizing narrow-leaved plants as var. *angustifolia* A. DC. Vatke (1874) expanded on this, dividing the species (under the illegitimate name *L. persicifolia*; see below) into five varieties: var. *laxiflora* (Kunth) Vatke, var. *mollis* Vatke, var. *warscewiczii* (Regel) Vatke, var. *amygdalina* Vatke, and var. *angustifolia* (A. DC.) Vatke. Little or no information on geographic distribution was provided. In support of his classification, Vatke commented that "omnes cultura sibi constant."

McVaugh (1943) divided *L. laxiflora* into four varieties, each of which had a reasonably coherent if overlapping geographic range: var. *angustifolia* (Arizona and Baja California to San Luis Potosí and Oaxaca), var. *laxiflora* (Puebla and Vera Cruz to Guatemala and Honduras), var. *nelsonii* (Fern.) McVaugh (Sonora to Chiapas), and var. *stricta* (Planch. & Oerst.) McVaugh (Michoacan, Jalisco and Nayarit south to Colombia). Wimmer (1953) segregated *L. laxiflora* var. *nelsonii* as a distinct species, *L. haenkeana* (C. Presl) A. DC., and carved three additional varieties out of the remaining three: var. *brevipes* E. Wimm., var. *patula* (Planch. & Oerst.) E. Wimm., and var. *petiolata* E. Wimm. With this classification, the degree of geographic overlap among varieties increased markedly. For example, three of the varieties were ascribed to Colombia, vs. one in McVaugh's scheme, and three to Guatemala, vs. two.

Eakes and Lammers (1996) undertook a detailed multivariate study of morphological variation in *L. laxiflora* and its allies *L. aguana* and *L. ghiesbreghtii*. States of 100 characters in 71 specimens were scored and these data subjected to cluster and principal components analyses. The results of their study failed to support either McVaugh's (1943) or Wimmer's (1953) classification; instead, they supported the original classification of Candolle (1839). Populations of *L. laxiflora* fell into two weakly discriminated clusters: narrow-leaved plants of northeastern Mexico and Arizona, and broad-leaved plants of the rest of the range. For the sake of consistency (cf. Lammers 1988, 1991, 1995), these two taxa were accorded the rank of subspecies by Lammers (1999); that treatment is followed here.

1a. *Lobelia laxiflora* subsp. *laxiflora*

Lobelia persicifolia Cav. Icon. 6:12. 1800, nom. illeg.; non Lam., Encycl. 3:584. 1792. *Lobelia cavanillesiana* Schult. in Roem. & Schult., Syst. Veg. 5:43. 1819 (Dec). *Lobelia cavanillesii* Mart., Ausw. Merkw. Pfl. 12. 1830, nom. superfl. *Rapuntium cavanillesianum* (Schult.) C. Presl, Prodr. Monogr. Lobel. 27. 1836; non *Rapuntium persicifolium* (Lam.) C. Presl, Prodr. Monogr. Lobel. 27. 1836. *Tupa persicifolia* G. Don in Sweet, Hort. Brit. ed. 3:424. 1839 (sero); non (Lam.) A. DC. in DC., Prodr. 7:395. 1839 (Dec). *Siphocampylus cavanillesii* J. W. Loud., Ladies' Fl. Gard. Orn. Greenh. Pl. 184. 1848; non *Siphocampylus cavanillesianus* G. Don, Gen. Hist. 3:702. 1834, nom. illeg. sub Art. 52.f; nec *Siphocampylus persicifolius* (Lam.) G. Don in Sweet, Hort. Brit. ed. 3:424. 1839. TYPE: MEXICO. Acambaro, *Née* s.n. (HOLOTYPE: MA [photographs: MA! W!]; ISOTYPE: MA!).

Lobelia rigidula Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 3:311 (quarto), 243 (folio). 1819 (Nov). *Rapuntium rigidulum* (Kunth) C. Presl, Prodr. Monogr. Lobel. 26. 1836. TYPE: "Amérique Équatoriale." *Humboldt* s.n. (HOLOTYPE: P-Bonpl. [IDC-microfiche; photographs: FI MICH!]).

- Lobelia fissa* Willd. ex Schult. in Roem. & Schult., Syst. Veg. 5:57. 1819 (Dec). TYPE: "America meridionalis," Humboldt 3918/Willdenow 3993 (HOLOTYPE: B-W [IDC-microfiche!]; ISOTYPES: B! [photographs: F! MICH!]) P-Bonpl. [IDC-microfiche; photographs: F! MICH!]. The isotype at P-Bonpl. is the holotype of *L. laxiflora*.
- Lobelia amygdalina* Willd. ex Schult. in Roem. & Schult., Syst. Veg. 5:57. 1819 (Dec). *Rapuntium amygdalinum* (Willd. ex Schult.) C. Presl, Prodr. Monogr. Lobel. 27. 1836. *Dortmanna amygdalina* (Willd. ex Schult.) Kuntze, Revis. Gen. Pl. 972. 1891. TYPE: "America meridionalis," Humboldt 4425/Willdenow 3992 (HOLOTYPE: B-W [IDC-microfiche!]).
- Rapuntium haenkeanum* C. Presl, Prodr. Monogr. Lobel. 26. 1836. *Lobelia haenkeana* (C. Presl) A. DC. in DC., Prodr. 7:382. 1839. *Dortmanna haenkeana* (C. Presl) Kuntze, Revis. Gen. Pl. 972. 1891. TYPE: PHILIPPINES. LUZON: *Haenke s.n.* (HOLOTYPE: PR! [photograph: F!]). As with *Rapuntium longifolium* (Thompson and Lammers 1997), the locality was an error and the specimen was actually collected in the New World (Merrill 1923).
- Lobelia prunifolia* Humb. ex C. Presl, Prodr. Monogr. Lobel. 37. 1836. *Siphocampylus prunifolius* (Humb. ex C. Presl) A. DC. in DC., Prodr. 7:401. 1839. TYPE: Sine loc., Humboldt 2167 (LECTOTYPE [designated by Wimmer 1953]; B! [photograph: F!]).
- Lobelia canescens* C. Presl, Prodr. Monogr. Lobel. 38. 1836. *Siphocampylus canescens* (C. Presl) A. DC. in DC., Prodr. 7:402. 1839. TYPE: MEXICO. Pasquaro, Humboldt s.n. (HOLOTYPE: PR! [photograph: F!]; ISOTYPES: B! B-W [IDC-microfiche!]).
- Siphocampylus bicolor* D. Don in Sweet, Brit. Fl. Gard. (ser. 2) 4:pl. 389. 1838. *Lobelia laxiflora* var. *bicolor* (D. Don) Endl., Cat. Hort. Acad. Vindobon. 1:436. 1842. *Tupa bicolor* (D. Don) Planch., Hort. Donat. 78. 1858. TYPE: GREAT BRITAIN. Messrs. Low & Co., raised from seeds collected in Georgia USA by Alexander Gordon (LECTOTYPE, here designated: Don 1838, pl. 389). Because no specimen that might be considered original material has been found, the plate that accompanied the original description is designated here as the lectotype. The geographic source of the seed is almost certainly an error, unless the plants were cultivated there.
- Lobelia ovalifolia* Hook. & Arn., Bot. Beechey Voy. 300. 1838. TYPE: MEXICO. [Nayarit: Tepic, 8 Dec 1827 - Feb 1828, leg. Lay.] *Beechey s.n.* (HOLOTYPE: K! [photograph: F!]; ISOTYPE: E!). Information in brackets for this and the two following names is taken from the official itinerary (Hooker & Arnott 1830).
- Lobelia angulato-dentata* Hook. & Arn., Bot. Beechey Voy. 301. 1838 (as 'angulato-dentata'). TYPE: MEXICO. [Nayarit: Tepic, 8 Dec 1827 - Feb 1828, leg. Lay.] *Beechey s.n.* (HOLOTYPE: K! [photographs: F! MICH!]; ISOTYPE: E!). The hyphen is deleted from the epithet in accordance with Art. 60.9.
- Lobelia lanceolata* Hook. & Arn., Bot. Beechey Voy. 301. 1838, nom. illeg.; non (Gaudich.) Hook. & Arn., Bot. Beechey Voy. 88. 1832. *Lobelia laxiflora* f. *lanceolata* E. Wimm., Pflanzent. IV.276b:683. 1953. TYPE: MEXICO. [Nayarit: Tepic, 8 Dec 1827 - Feb 1828, leg. Lay.] *Beechey s.n.* (HOLOTYPE: K! [photographs: F! MICH!]).
- Lobelia concolor* M. Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 9(2):46. 1842, nom. illeg.; non R. Br., Prodr. 563. 1810. *Dortmanna concolor* Kuntze, Revis. Gen. Pl. 972. 1891. *Lobelia laxiflora* f. *concolor* (Kuntze) E. Wimm., Pflanzent. IV.276b:684. 1953. TYPE: MEXICO. VERACRUZ: Xalapa, 4000 ft, Jun-Oct [Nov-Apr on K isotype] 1840, Galeotti 1972 (HOLOTYPE: BR! [photograph: F!]; ISOTYPES: BR! G! K!).
- Lobelia andina* Benth., Pl. Hartweg. 213. 1845. TYPE: COLOMBIA. Andes of Popayan, 8000 ft, Hartweg 1183 (HOLOTYPE: K! [photographs: F! MICH!]; ISOTYPE: K! [photograph: F!]).
- Siphocampylus mollis* Regel, Flora 33:353. 1850 (21 Jun); non Planch., Fl. Serres Jard. Eur. 6:36. 1850 (incerta). *Siphocampylus warscewiczii* Regel, Schweiz. Z. Gartenbau 1850:131. 1851. *Lobelia persicifolia* var. *warscewiczii* (Regel) Vatke, Linnæa 38:723. 1874. TYPE: GERMANY. Berlin Botanic Garden, grown from seed sent by Warscewicz from Guatemala (neotype here designated: Regel 1851, unnumbered plate!). Because no specimen that might be considered origi-

nal material has been found, and as no illustration accompanied the original description, a plate published soon after by its author is designated as the neotype.

- Tupa costaricana* Planch. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1857:154. 1857. *Tupa costaricana* var. *stricta* Planch. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1857:155. 1857. *Lobelia costaricana* (Planch. & Oerst.) E. Wimm., Ann. Naturhist. Mus. Wien 46:239. 1933. *Lobelia laxiflora* var. *stricta* (Planch. & Oerst.) McVaugh, N. Amer. Fl. 32A:96. 1943. TYPE: COSTA RICA. Prope Cartago, Oersted 9245 (LECTOTYPE [designated by McVaugh 1943]: C! [photographs: F! G! H! MICH!]; ISOLECTOTYPES: C[4]! [photographs: F!]). Though it seems that the name *T. costaricana* var. *stricta* was used for the nomenclaturally typical ("α") variety, no types were cited and the name thus is validly published under Art. 26.2.
- Tupa costaricana* var. *patula* Planch. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1857:155. 1857. *Lobelia laxiflora* var. *patula* (Planch. & Oerst.) E. Wimm., Pflanzn. IV.276b:683. 1953. TYPE: COSTA RICA. CARTAGO: southern slopes of Volcán Irazú in small patches of woods left in cleared meadows, 2500 m, 27 Mar 1967, Wilbur & Stone 8747 (neotype here designated: MICH! [photograph: F!]). Because no original material could be located, a specimen from the same general area which conforms to the protologue is here chosen as the neotype.
- Lobelia persicifolia* var. *mollis* Vatke, Linnaea 38:722. 1874. *Lobelia laxiflora* var. *mollis* (Vatke) Zahlbr., Repert. Spec. Nov. Regni Veg. 14:185. 1916. TYPE: not located. Name based on plants grown in the botanic garden at Berlin in 1854, their origin unknown. McVaugh (1943) reported seeing what he considered the type specimen at B, but did not cite details. It is no longer extant (cf. Lammers 1994), nor does the Field Museum's Type Photograph Collection (cf. Nitecki 1980, Grimé and Plowman 1986) contain a photo of it (C. Niezgodá, pers. comm.).
- Lobelia patzcuarensis* Sessé & Moc., Pl. Nov. Hisp. 152. 1890. TYPE: MEXICO. [MICHUACÁN: Pátzcuaro, in frigidis et saxosis montibus, Sep 1790.] Sessé and Moçino *Icones Florae Mexicanae* 398 (HOLOTYPE: Hunt Institute-6331.119 [color transparency; photograph: F!]; ISOTYPE: MA [photograph: F!]). The information in brackets is taken from the protologue and McVaugh (1977).
- Lobelia nelsonii* Fern., Proc. Amer. Acad. Arts 36:503. 1901. *Lobelia laxiflora* var. *nelsonii* (Fern.) McVaugh, Ann. Missouri Bot. Gard. 27:349. 1940. TYPE: MEXICO. JALISCO: along road near Huachinango, oak woods on hills, 4500–5500 ft, 4 Mar 1897, Nelson 4009 (HOLOTYPE: GH! [photograph: F!]; ISOTYPES: GH! US! [photographs: F! W!]).
- Lobelia laxiflora* var. *brevifolia* Zahlbr., Repert. Spec. Nov. Regni Veg. 14:185. 1916. *Lobelia laxiflora* f. *brevifolia* (Zahlbr.) E. Wimm., Pflanzn. IV.276b:684. 1953. TYPE: COLOMBIA. NARIÑO: Pasto, Río Guaitara, 1600–2000 m, Lehmann 4674 (HOLOTYPE: K! [photograph: F!]).
- Lobelia laxiflora* var. *foliosa* Zahlbr., Repert. Spec. Nov. Regni Nov. 14:185. 1916. TYPE: COLOMBIA. CAUCA: bei Chapa, 1850 m, über Popayan, 2200m, Mar 1884, Lehman 3656 (HOLOTYPE: G! [photograph: F!]; ISOTYPES: BM! K! US!).
- Lobelia delessertiana* E. Wimm., Repert. Spec. Nov. Regni Veg. 19:386. 1924. TYPE: MEXICO. OAXACA: Oct 1842, Ghiesbreght s.n. (HOLOTYPE: G! [photograph: F!; fragment: W!]).
- Lobelia lorentensis* M. E. Jones, Contr. W. Bot. 18:68. 1933. TYPE: MEXICO. BAJA CALIFORNIA: Primera Agua, near Loreto, 19 Oct 1930, Jones 27279 (HOLOTYPE: POM! [photograph: F!]; ISOTYPE: POM!).
- Lobelia costaricana* var. *magna* E. Wimm., Repert. Spec. Nov. Regni Veg. 38:85. 1935. *Lobelia laxiflora* f. *magna* (E. Wimm.) E. Wimm., Pflanzn. IV.276b:684. 1953. TYPE: MEXICO. Sine loc., 1835, Hegewisch s.n. (HOLOTYPE: GOET! [photograph: F!]).
- Lobelia ransonii* E. Wimm., Repert. Spec. Nov. Regni Veg. 38:85. 1935. TYPE: EL SALVADOR. Vicinity of San Salvador, Renson 54 (HOLOTYPE: NY! [photograph: F!]).
- Lobelia haenkeana* var. *panamensis* E. Wimm., Ann. Naturhist. Mus. Wien 56:368. 1948. TYPE: PANAMA. CHIRIQUE: forests around El Boquete, banks of rivers, 1000–1300 m, 2 Mar 1911, Pittier 2869 (HOLOTYPE: US! [photograph: F!]).
- Lobelia laxiflora* var. *petiolata* E. Wimm., Ann. Naturhist. Mus. Wien 56:369. 1948. TYPE: MEXICO.

OAXACA: Jotao, 4000 ft. *Galeotti* 1989B (LECTOTYPE, here designated: B! [photograph: F!]). Wimmer cited this plus Liebmann material from Chinantla in unspecified herbaria. While I have seen sheets of the latter at BM, MO, and NY, none was annotated by Wimmer, while in 1942 he annotated the Galeotti specimen as "orig!"

Lobelia laxiflora f. *lutea* Standl. & Steyerl., Publ. Field Mus. Nat. Hist., Bot. Ser. 23:98, 1944. TYPE: GUATEMALA. QUETZALTENANGO: above Santa Maria de Jesús, moist thicket, 1650 m, 1 Mar 1939, Standley 67195 (HOLOTYPE: F!; ISOTYPE: NY!).

Lobelia laxiflora f. *flava* E. Wimm., Pflanzent. IV:276b.685, 1953. TYPE: EL SALVADOR. Volcán de San Salvador, brushy slope, 1000–1800 m, 7 Apr 1922, Standley 22973 (HOLOTYPE: US; ISOTYPE: NY!).

Stems glabrous or pubescent. Lamina ovate, lanceolate, elliptic, narrowly elliptic, or oblong, 2.5–19 cm long, 1–5 cm wide; adaxial surface glabrous or sparsely pubescent; abaxial surface glabrous or pubescent; margin denticulate, serrulate, serrate, or doubly serrate; apex acuminate or acute; base cuneate, obtuse, or rounded; petiole (when present) 1–7 mm long. Pedicels 20–100 mm long, erect, ascending, spreading, or incurved, stiff or flexuous. Hypanthium 2–5 mm long, 4–11 mm in diameter, glabrous or pubescent. Calyx lobes subulate, linear triangular, narrowly triangular, or triangular, 1.5–6 mm long, 0.8–2 mm wide, glabrous or pubescent. Corolla 24–40 mm long; tube 14–25 mm long, 4–9.5 mm in diameter at base, 3.5–7 mm in diameter at mouth; dorsal lobes 10–22 mm long; ventral lip 10–20 mm long, the segments 1–10 mm long, 0.5–2 mm wide. Filament tube 18–34 mm long; anther tube 1.5–3.9 mm in diameter; dorsal anthers 6–8.5 mm long; ventral anthers 4.5–7.5 mm long. Capsules 8–12 mm long, 7–9 mm in diameter. Chromosome number $n = 7$ (Ayers 1986).

Icones.—Cavanilles (1801), pl. 518 [as *L. persicifolia*]; Don (1838), pl. 389 [as *S. bicolor*]; Knowles and Westcott (1838), pl. 69 [as *S. bicolor*]; Loudon (1848), pl. 37 fig. 1 [as *S. cavanillesii*]; Wittmack and Graebener (1889), pl. 1301 and Abbildung 54; Wimmer (1953), figs. 103a1, 103a3 [as *L. laxiflora* var. *petiolata*], 103a4 and 103a5 [as *L. laxiflora* var. *stricta*], 103b [as *L. haenkeana*], 103c [as *L. delessertiana*]; Nash (1976), fig. 54D–I; Wilbur (1977), fig. 6 [as *L. laxiflora* var. *stricta*]; Mason and Mason (1987), p. 228.

Distribution, habitat, and phenology.—Throughout much of Mexico, from Baja California del Sur, southern Sonora, and southern Chihuahua, south throughout Central America to Panama, and in the Cordillera Occidental of southwestern Colombia. Populations occur at elevations of 250–3450 m, in a wide variety of dry to mesic open to shaded habitats, often on slopes, and most commonly associated with various types of coniferous, deciduous, and mixed forests. In the northern portion of its range (Sonora, Chihuahua, Durango), flowering begins in February and continues through June. The flowering season becomes progressively longer to the south: starting in December in Sinaloa and Nayarit, in October from Jalisco and Queretaro south to Oaxaca, and essentially year-round from Veracruz and Chiapas south to Colombia.

Vernacular Names.—Numerous local names have been recorded on her-

barium labels and in the literature. In Mexico, these include the Nahuatl names *chipalxochil* and *oxpatzihuatl*; the Tzeltal names *ch'aal wamal*, *pameyat*, *pameyat te'*, *pirima najk*, *tak'inal chikin*, *tujtin pamayat*, *turisna wamal*, and *tzajal nich*; the Tzotzil names *bik'tal ba ikatzil*, *pimil jomol*, *piri nich jomol*, *pojovil jomol*, *poxil yaijel*, *putzil nichim*, *rimon*, *rion vomol*, *sera nich jomol*, and *turisno vet*; and the Spanish names *aretillo* (Vera Cruz), *campanilla* (Puebla), *campanita* (Puebla), *campanole* (Puebla), *chilitos* (Michoacan), *chilillo* (Puebla), *clarincillo* (Jalisco), *cordoncillo* (Puebla), *hierba de burro* (Guerrero), *hierba del manzo* (Nayarit), *huajillo* (Jalisco), *primón* (Chiapas), *yerba del aigre* (Baja California), and *zarcillillo* (Jalisco). In Central America, the plant is known as *caballito* (Honduras), *chilillo* (Guatemala; Nash 1976), *cohetillo* (Guatemala; Nash 1976), *diente de chucho* (El Salvador, Honduras), *diente de perro* (Honduras, Nicaragua), *lengua de chuco* (El Salvador), *pastorcito* (El Salvador), *quiebramachete* (Guatemala; Nash 1976), *srukatzunúm* (Guatemala; Nash 1976), and *yuquilla* (Costa Rica).

Ethnobotany.—Herbarium labels also provide much information on local use of the plant. The Tzeltal use the roots to promote conception, aid menstruation, and relieve flatulence; the leaves and roots to treat stomach pains; the leaves to treat coughs and tuberculosis; and the entire plant to treat heart pains. The Tzotzil use the latex to treat wounds and relieve itching; the roots to relieve colic; and the leaves to relieve diarrhea, fever, and headache. In Puebla, the plant is used in baths to relieve rheumatism; in Veracruz, to treat pimples; in El Salvador, to induce vomiting and treat internal inflammation. According to Weimann and Heinrich (1997), the Nahuatl bathe in an infusion of the aerial parts to treat skin inflammations, local infections, and wounds. Nash (1976) stated that it was sometimes used in Guatemala as a remedy for mange in horses and dogs. Recently, bulk material was collected for pharmacological screening.

Discussion.—As one might suspect from the lengthy synonymy, this subspecies shows considerable morphological variation. Pubescence is especially variable, with plants spanning a continuum from perfectly glabrous to densely canescent. Pedicels vary conspicuously, from stiff erect stalks holding the flowers close to the rachis of the raceme, to lax flexuous stalks that create a very open diffuse inflorescence. However, morphometric analyses by Eakes and Lammers (1996; cf. Hamlin 1995; Lammers 1999) did not reveal any geographically correlated gaps in the pattern of variation, by which additional taxa might be distinguished. The variation is real, but it does not sort itself into a meaningful pattern.

Plants with all-yellow flowers lacking any red or orange pigment have been collected in Jalisco (*Cuevas & Nieves* 2210, WIS; *Iltis et al.* 29556, WIS; *McVaugh* 10037, MICH), Guatemala (*Standley* 65175, F; *Standley* 67195, F, NY), and El Salvador (*Standley* 22973, NY). For those interested in such things, the correct name in this subspecies for plants of this sort is *f. lutea* Standl. & Steyerl.

Representative specimens. **MEXICO. Chiapas:** Pueblo Nuevo Solistahuacán, *Raven & Bredlove* 19823 (ARIZ, BM, MICH, TEX). **Chihuahua:** Sierra Charuco, *Gentry* 8091 (ARIZ, RSA, US). **Colima:** Colima, *Kerber* 117 (B). **Distrito Federal:** Desviación a El Conejo, *Ventura* 1234 (CAS). **Durango:** San Ramón, *Palmer* 88 (F, GH, MO, NY, US). **Guanajuato:** 7–8 mi above Xichú, *McVaugh* 14837 (MICH). **Guerrero:** Petlacala, *Mexia* 9034 (ARIZ, F, G, K, MO, NY, W). **Hidalgo:** Hwy 85, *Parfitt & Kaspar* 824 (OSH). **Jalisco:** near Guadalajara, *Pringle* 3112 (B, BM, BR, E, F, G, GH, GOET, K, MO, MU, NY, PH, RSA, US, W, WIS, WU). **Mexico:** 1 km W of Nanachititla, *Rzedowski* 22101 (DS, ENCB, MICH, WIS). **Michoacan:** San Miguel de las Cuevas, *Rzedowski* 50603 (F, MA). **Morelos:** 12 mi NE of Cuernavaca, *Ayers & Scott* 118 (TEX). **Nayarit:** Tepic, *Lamb* 603 (B, DS, E, F, G, GH, MO, NY, US). **Oaxaca:** 5 mi N of Ixtlan de Juarez, *Harriman* 14362 (OSH). **Puebla:** 5 km E of Huauchinango, *Fosberg* 29389 (MU, OSH). **Queretaro:** 2 km W of Santa Agueda, *Zamudio* 6109 (MEXU). **San Luis Potosi:** 10 mi S of Xilitla, *Harriman et al.* 10869 (OSH). **Sinaloa:** Canyon de Tarahumare, *Gentry* 7168 (ARIZ, GH, MICH, RSA). **Sonora:** Tepopa, *Gentry* 1431 (A, ARIZ, F, MO, WIS). **Yera Cruz:** La Monera, *Ventura* 317 (ARIZ, DS, ENCB, LL, RSA, WIS).

GUATEMALA. Alta Verapaz: Coban, *Tuerckheim* 73 (B, BR, G, GOET, K, NY, PH, WU). **Baja Verapaz:** Union Barrios, *Contreras* 11027 (L.L.). **Chemaltenango:** Tecpán, *Molina et al.* 16096 (NY, W). **Chiquimula:** La Cumbre, *Molina & Molina* 26813 (ENCB, MICH). **Escuintla:** Finca El Rosario de La Vista Hermosa, *Wilbur* 14732 (GH, MICH, MO). **Guatemala:** 21 km NW of Guatemala City, *Molina et al.* 15991 (NY). **Huehuetenango:** Todos Santos, *Melhus & Goodman* 3609 (ISC). **Quezaltenango:** 2 km W of Zunil, *Williams et al.* 23016 (NY). **Quiché:** Utatlán Ruins, *Molina & Molina* 25082 (MO). **Sacatepequez:** Cuesta Las Canas, *Castillo & Luarda* 1649 (F). **San Marcos:** 6 km N of San Marcos, *Williams et al.* 25899 (NY). **Santa Rosa:** Aguacoliente, *Kellerman* 7714 (NY). **Solola:** 1 km W of Mirador Mario Mendez Montenegro, *Boeke & Utzschneider* 2861 (F). **Suchitepequez:** Finca Moca, *Skutch* 2119 (NY).

HONDURAS. Atlántida: road from Olanchito to La Ceiba, *Blackmore & Chorley* 4102 (BM, TEFH). **Choluteca:** road between Sabana Grande and Pespire, *Pilz & Pilz* 1538 (MO). **Comayagua:** 2 1/2 km E of Terreritos, *Leitz* 319 (TEFH). **Copán:** near El Mirador, *Blackmore & Chorley* 3792 (BM, F, TEFH). **Cortes:** Montaña San Idelfonso, *Molina* 11567 (NY). **El Paraíso:** Cerro Montserrat, *Nelson & Vargas* 2410 (TEFH). **Francisco Morazán:** Cerro Triquilapa, *Nelson* 3931 (TEFH). **Intibucá:** 9 km S of La Esperanza, *Barkley & Hernández* 40102 (GH, TEFH). **La Paz:** 7 km S of Marcala, *Keyser* 1152 (TEFH). **Lempira:** 2 km from Frandique, *Molina* 24038 (NY). **Ocatepeque:** Alrededores de Belén Gualcho, *Rubio* 52 (MO). **Olancho:** 20 km W of Campamento, *Izaguirre* 166 (TEFH). **Santa Bárbara:** San Pedro Sula, *Thieme* 5335 (B, G, K, MICH, MO, NY).

EL SALVADOR. Ahuachapán: 2–3 mi NE of Puente Impossible, *Croat* 42156 (MO). **Libertad:** El Boqueron crater, *Davidse & Pohl* 2032 (MO). **Morazán:** Montes de Cacaguatique, *Tucker* 614 (G, K, MICH, NY, PH). **Sonsonate:** Cerro Verde, *Molina & Montalvo* 21727 (NY). **San Salvador:** San Marcos, *Carlson* 9 (CAS, MO). **San Vicente:** San Vicente, *Standley* 21202 (MO, NY).

NICARAGUA. Chinandega: Volcán San Cristóbal, *Moreno* 24998 (NY). **Esteli:** Fila La Estrechura, *Stevens* 22794 (MO). **Granada:** Plan de Las Flores, *Moreno* 91 (MO). **Jinotega:** 2 mi S of Jinotega, *Wilbur & Almeda* 16509 (LL, MICH). **Leon:** San Nicholas, *Moreno* 22723 (MO). **Madriz:** Cerro Volcán de Somoto, *Araquistain & Moreno* 2116 (ENCB, MO). **Managua:** Sierra de Managua, *Stevens* 4749 (ENCB, MO). **Matagalpa:** Finca Santa Maria de Pstuma, *Williams & Molina* 42590 (MICH). **Nueva Segovia:** N of Ocotal, *Atwood & Seymour* 5005 (B, BM, MICH, NY, TEX).

COSTA RICA. Alajuela: 6 mi SW of San Ramón, *Wilbur & Stone* 9918 (DS, GH, MICH, NY, TEX, US). **Cartago:** Volcán Irazú, *Hill et al.* 17809 (F, GH, NY). **Heredia:** Volcán Barba, *Hatheway* 1317 (F, GH, US). **Puntarenas:** 10 km W of Monteverde, *Wilbur* 14230 (F, MO). **San José:** San Ignacio, *Khan et al.* 213 (BM, MO).

PANAMA. Chiriqui: Volcán Baru, *Stein* 1264 (MO). **Coclé:** 7 km from El Valle de Antón, *Wilbur & Luteyn* 11703 (DS, F, GH, LL, MICH, MO, NY, RSA). **Darien:** Cerro Pirre, *Duke & Elias* 13716a (MO). **Panama:** 6 km S of El Valle, *Sytsma & D'Arcy* 3562 (CAS).

COLOMBIA. Cauca: Coconuco, *Yepes* 337 (COL, F, US). **Nariño:** Yacuanquer, *Uribe* 5289 (COL).

CULTIVATION: U.S.A.: Washington, 12 Mar 1870, *Schott s.n.* (F). **Great Britain:** Begonia House,

Jan 1892, *anonymous s.n.* (K). **Germany:** Dahlem, 12 Mar 1922, *Schlechter s.n.* (B). **Egypt:** Cairo, 1885, *Schweinfurth s.n.* (B). **Kenya:** Kaporetwa near Kitale, *Verdcourt 2451* (K).

1b. *Lobelia laxiflora* subsp. *angustifolia* (A. DC) Eakes & Lammers, Novon 9:384.

1999. *Lobelia laxiflora* var. *angustifolia* A. DC. in DC., *Prodr.* 7:383. 1839. *Lobelia persicifolia* var. *angustifolia* (A. DC.) Vatke, *Linnaea* 38:723. 1874. *Lobelia laxiflora* f. *angustifolia* (A. DC.) Voss in Siebert & Voss, *Vilm. Blumengärt. ed.* 3:1576. 1894. *Lobelia angustifolia* (A. DC.) Urbina, *Cat. Pl. Mexican.* 201. 1897, nom. illeg.; non Cham., *Linnaea* 8:219. 1833; nec Benth. in Endl., *Enum. Pl.* 74. 1837. TYPE: MEXICO, MEXICO: Toluca, Apr 1834, *Andrieux 267* (LECTOTYPE [designated by Eakes and Lammers in Lammers 1999]; K! [photograph: F!]; ISOLECTOTYPES: K! W!).

Lobelia dracunculoides Willd. ex Schult. in Roem. & Schult., *Syst. Veg.* 5:56. 1819 (Dec). TYPE: "America meridionalis," leg. Humboldt and Bonpland, *Herb. Willdenow 3989* (HOLOTYPE: B-W [IDC-microfiche!]).

Rapuntium kunthianum C. Presl, *Prodr. Monogr. Lobel.* 27. 1836. *Lobelia persicifolia* var. *amygdalina* Vatke, *Linnaea* 38:723. 1874. Both validated by reference to: *Lobelia persicifolia* Cav. sensu Kunth in Humb., *Bonpl. & Kunth, Nov. Gen. Sp.* 3:310 (quarto), 242 (folio). 1819 (Nov). TYPE: MEXICO, MEXICO: prope Zumpango, *Humboldt & Bonpland s.n.* (LECTOTYPE [designated by Eakes and Lammers in Lammers 1999]; P-Bonpl. [microfiche!]; ISOLECTOTYPES: B, B-W [microfiche!]). Presl's binomial was not an avowed substitute name for *L. persicifolia* Cav., nom. illeg. (see above), as on the same page, he recognized that species under the replacement name *R. cavanillesianum* (Schult.) C. Presl. Similarly, Vatke's trinomial was not a new combination based on *L. amygdalina* Willd. ex Schult., as Vatke explicitly stated that the type specimen of that name pertained to *L. persicifolia* Cav., sens. str.

Lobelia cavanillesii var. *lutea* F. Haage & K. Schmidt, *Gartenflora* 52:577. 1903. *Lobelia laxiflora* f. *lutea* (F. Haage & K. Schmidt) E. Wimm., *Pflanzenr.* IV:276b:682. 1953, nom. illeg.; non Standl. & Steyerl., *Publ. Field Mus. Nat. Hist., Bot. Ser.* 23:98. 1944. TYPE not located. Name based on yellow-flowered plants raised from seed of normally pigmented progenitors at a commercial nursery in Erfurt, Germany. This spontaneous appearance of yellow-flowered variants from seed has also been observed in *L. excelsa* of sect. *Tupa* (Lammers 2000).

Lobelia nelsonii var. *fragilis* B. L. Rob. & Fern., *Proc. Amer. Acad. Arts* 43:27. 1907. *Lobelia laxiflora* f. *fragilis* (B. L. Rob. & Fern.) E. Wimm., *Pflanzenr.* IV:276b:682. 1953. TYPE: MEXICO, MORELOS: Parque Station, rocky hills, 7500 ft, 13 Feb 1907, *Pringle 10360* (HOLOTYPE: GH! [photograph: F!]; ISOTYPES: BI BM! E! F! G!3! GOET! K! MEXU! MIN! MO! NY! PH! US! W!).

Lobelia laxiflora var. *brevipes* E. Wimm., *Pflanzenr.* IV:276b:683. 1953. TYPE: MEXICO, BAJA CALIFORNIA: Cape region, Jan-Mar 1901, *Purpus 234* (HOLOTYPE: WU!; ISOTYPES: E! KI MO! US!).

Stems glabrous. Lamina linear, lanceolate, or narrowly elliptic, 5–15 cm long, 0.2–1.4 cm wide, glabrous; margin serrulate or serrate; apex acuminate; base attenuate; petiole (when present) 1–5 mm long. Pedicels 25–85 mm long, erect or ascending, stiff. Hypanthium 3–5 mm long, 6–9 mm in diameter, glabrous. Calyx lobes linear triangular, narrowly triangular, or triangular, 1–6 mm long, 1–3 mm wide, glabrous or pubescent. Corolla 28–38 mm long; tube 14–20 mm long, 5–8 mm in diameter at base, 4.5–6 mm in diameter at mouth; dorsal lobes 11–17 mm long; ventral lip 12–17 mm long, the segments 1–5 mm long, 0.5–1.2 mm wide. Filament tube 21–31 mm long; anther tube 1.7–2.4 mm in diameter; dorsal anthers 7–9 mm long; ventral anthers 5.5–7.5 mm long. Capsules 6–10 mm long, 7–8 mm in diameter. Chromosome number $n = 7$ (Ayers 1986).

Icons.—Martius (1830), pl. 9 [as *L. cavanillesii*]; Hooker (1837), pl. 3600 [as

L. cavanillesii]; Anonymous (1915), fig. 82; McVaugh (1940), figs. 4, 9; Wimmer (1953), fig. 103a2 [as *L. laxiflora* var. *brevipes*]; Thomas (1990), pl. II no. 6; Lancaster (1991), pp. 474–475; Anonymous (2003), pp. 40–41 (unidentified).

Distribution, habitat, and phenology.—Throughout northeastern Mexico, from Sonora and Chihuahua to Puebla, with one population in the United States, in southern Arizona. Populations occur at elevations of 1300–3400 m, in a wide variety of mesic to relatively wet open to shaded habitats, often on stream bottoms and gravel bars, and most commonly associated with various types of coniferous, deciduous, and mixed forests. In the northern part of the range, flowering begins in March, while in the south, it begins as early as October; flowering typically is finished by June or July.

Vernacular Names.—Names recorded on herbarium labels include *aretillo*, *contrahiedra*, and *pericos*.

Ethnobotany.—Labels of several specimens from Puebla mention unspecified medicinal usage of the plant.

Discussion.—Plants from Guerrero, formerly identified as this taxon, differ in a number of morphological traits and have been segregated as *L. guerrerensis* (see below).

Plants with all-yellow flowers totally lacking any red or orange pigment have been collected in Durango (*Bredlove 14314*, CAS, MICH) and Zacatecas (*Jones 397*, POM, US), and have apparently appeared spontaneously in cultivation (Anonymous 1903). There is no legitimate name at the rank of *forma* for plants of this sort in this subspecies.

Representative specimens. **U.S.A. ARIZONA:** Santa Cruz Co.: Sycamore Canyon, *McManus et al.* 326 (ARIZ), 1 Jun 1992, *Scott s.n.* (ASU).

MEXICO. Aguascalientes: Sandoval, *Figueroa 24* (RSA). **Baja California:** Arroyo de San Francisquito, *Carter & Ferris* 3335 (DS, TEX, US); Sierra Laguna, *Gentry* 4431 (ARIZ, DS, GH, K, MO). **Chihuahua:** 1 mi N of Maguarachi, *Avers & Scott* 394 (TEX); Cascada de Basaseachic, *Yen & Estrada* 4125 (MU, OSH). **Distrito Federal:** 4 km SW of Santa Lucia, *Rzedowski* 27248 (DS, ENCB, MICH); Rancho El Conejo, *Ventura* 2610 (ASU, ENCB, MICH). **Durango:** Tobar, *Palmer* 255 (C, F, GH, MO, NY, US); 19 mi. SW of Durango, *Ripley & Barneby* 13496 (CAS, NY). **Guanajuato:** Guanajuato, *Duges* 24 (GH). **Hidalgo:** Tecozautla, *Argüelles* 2014 (OSH); Dublin, *Pringle* 13095 (B, C, CAS, F, GH, MICH, MO, US). **Jalisco:** 4 km SW of Villa Guerrero, *Flores* 2332 (TEX, WIS); 7 mi. SW of Teocaltiche, *McVaugh* 11977 (MICH). **Mexico:** Valley of Mexico, *Pringle* 1457 (F, G, GH, K, NY, RSA, US, WIS, WU); San Bernardino, *Ventura* 365 (ENCB, F). **Michoacan:** Morelia, *Arsène* 5417 (BM, GH, MO, NY, US); Zamora, *Nelson* 6535 (GH, NY, US). **Morelos:** 7.5 mi W of Tres Cumbres, *McPherson* 959 (CAS, ENCB, MICH); Tepetitl, *Sánchez* 2133 (ARIZ). **Oaxaca:** 5 km N of Tamazulapan, *Lorence & Garcia* 3456 (CAS, ENCB); Teposcolula, *Mendoza* 154 (ENCB, NY). **Puebla:** Tlamililolpan, *Flapa & Ubierna* 634 (MEXU); Acatzingo a Tepeaca, *Vibrans* 3032 (MEXU); San Francisco Tepeyacac, *Whitmore* 12 (ENCB, MICH, WIS). **Queretaro:** Hda. Rivera, *Arsène* 20600 (MO). **San Luis Potosi:** San Luis Potosí, *Parry & Palmer* 560 (B, BM, E, F, G, ISC, K, MO, NY, PH, US); Rio Ahogado, *Rzedowski* 5459 (ENCB, MICH). **Sonora:** 32 mi. E of Yecora, *McLaughlin* 547 (ARIZ); 10 mi. E of Imuris, *Wiggins* 11653 (MICH, TEX, US). **Tlaxcala:** Tlaxcala, *Balls & Gourelay* B.4831 (B, BM, K, NY, US); Ciénega de San Juan Zacualpan, *Weber* 181 (ENCB). **Zacatecas:** 24 mi SW of Jalpa, *Mahler & Thieret* 5818 (OSH); San Antonio, *McVaugh* 12032 (MICH).

CULTIVATION. U.S.A. Arizona: Tempe, *Keil & Lehto* 6197 (ASU). California: Berkeley, *Bracelin*

1262 (BR, RSA); San Francisco, Norris 4343 (OSH). **GERMANY:** Berlin, 1 May 1924, Schlechter s.n. (B). **ZIMBABWE:** Salisbury, Biegel 3977 (K).

2. *Lobelia guerrensis* Eakes & Lammers, Novon 9:381. 1999. TYPE: MEXICO. GUERRERO: municipio de Atoyac de Alvarez, a 6 km al SO de Puerto del Gallo, bosque mesófilo de montaña, 2320 m, 29 Mar 1983. Soto & Martínez 5136 (HOLOTYPE: MEXU).

Stems 1–2 m tall, woody or suffruticose, branched or unbranched, erect or ascending, glabrous. Leaves sessile; lamina linear or lanceolate, 7–18 cm long, 0.3–1.1 cm wide, cernuous; adaxial surface glabrous; abaxial surface glabrous; margin entire or sometimes with a few distant minute callose teeth, minutely revolute; apex narrowly acuminate; base cuneate or attenuate. Flowers solitary in the axils of the upper leaves; pedicels 60–130 mm long, ascending, spreading, or slightly incurved, stiff, glabrous, bibracteolate below the middle; bracteoles linear, 0.5–3 mm long. Hypanthium depressed hemispheric, 4–5 mm long, 9–11 mm in diameter, glabrous; base rounded or truncate. Calyx lobes narrowly triangular or triangular, 2.5–5 mm long, 1–2 mm wide, glabrous; margin entire. Corolla bilabiate, yellow or yellowish orange on tube, grading to orange or red on the lobes, 35–44 mm long, glabrous; tube 19–25 mm long, 7–10 mm in diameter at base, 6–8 mm at mouth, tapering slightly towards mouth; dorsal lobes linear, 14–22 mm long, 1.5–3 mm wide, recurved, half as long as the tube, acute at apex; ventral lip 12–21 mm long, the segments triangular, 4–8 mm long, 1.5–2.5 mm wide, acute at apex. Filament tube 29–33 mm long, 1.3–1.7 mm in diameter, pale yellow, glabrous; anther tube 2.5–4 mm in diameter, the surface densely covered with dirty yellow trichomes 2–4 mm long; dorsal anthers 8.5–9 mm long; ventral anthers 7–7.6 mm long, with tufts of yellow trichomes 1.5–2 mm long at apex. Capsules broadly ovoid, 8–10 mm long, 9–11 mm in diameter; seeds oblong or ellipsoid, 0.7–0.8 mm long, 0.3–0.4 mm wide, 0.1–0.2 mm thick, the testa faintly striate.

Icon.—Lammers (1999), Fig. 1.

Distribution, habitat, and phenology.—Endemic to Guerrero, Mexico, where it grows on steep wooded slopes and moist banks in pine, pine-oak, and mixed deciduous forests, at elevations of 1890–2750 m in the Sierra Madre del Sur. Flowering begins in early October and continues through February.

Discussion.—This species was first collected by Ynes Mexia in 1937. That initial gathering was identified as *L. laxiflora* var. *angustifolia* by Rogers McVaugh, as were most subsequent collections by their collectors or by specialists. However, multivariate analyses by Eakes and Lammers (1996; cf. Hamlin 1995; Lammers 1999) revealed that these Guerrero plants differed consistently from *L. laxiflora* subsp. *angustifolia* in a number of features, specifically their glabrous herbage, cernuous leaves with minutely revolute and usually entire margin, the reverse pigmentation of the flowers (i.e., tube yellow and lobes red), the longer apical teeth of the ventral corolla lip, the long dense pubescence of the anther tube, and the slightly larger seeds.

Representative specimens. **MEXICO.** **Guerrero:** Mazatlán, *Berlín* 53 (ENCB); 1–3 km NW of Puerto El Gallo, *Breedlove* 36058 (CAS, MICH); 37.9 km NE de El Paraiso, *Cowan* 4961 (TEX); 6.5 km W de Puerto del Gallo por camino a Paraiso, *Hernández & Tenorio* 858 (MICH); second ridge west of Perlacala, *Mexia* 9049 (ARIZ, B, CAS, G, K, MO, NY, W); 3 mi SW of Puerto del Gallo, *Reveal et al.* 4337 (CAS, GH, K, MICH, MO, NY, TEX); Cerro Alquitrán cerca Tuxpan, 9 Jan 1977, *Schwabe* s.n. (B).

3. *Lobelia aguana* E. Wimm., *Repert. Spec. Nov. Regni Veg.* 38:86. 1935. TYPE: GUATEMALA. DEPT. SACATEPÉQUEZ: Volcano Agua, 10500 ft, 4 Feb 1908, *Kellerman* 7502 (HOLOTYPE: FI; ISOTYPES: MEXU! NY! US!).

Lobelia laxiflora var. *insignis* Donn. Sm., *Bot. Gaz. (Crawfordsville)* 16:12. 1891. TYPE: GUATEMALA. DEPT. SACATEPÉQUEZ: Volcan de Agua, 10000 ft, Apr 1890, *Donnell Smith* 2173 (HOLOTYPE: US! [photograph: FI]; ISOTYPES: B! K! [photograph: FI]).

Stems 0.5–3 m tall, woody or suffruticose, branched or unbranched, erect or ascending, glabrous or pubescent. Leaves sessile or petiolate; lamina lanceolate or narrowly elliptic, 9–22 cm long, 1.3–4.5 cm wide; adaxial surface glabrous or rarely pubescent; abaxial surface pubescent or rarely glabrous; margin serrulate or serrate; apex narrowly attenuate; base attenuate, cuneate, or rarely rounded; petiole (when present) 1–7 mm long, glabrous or pubescent. Flowers solitary in the axils of the upper leaves; pedicels 85–210 mm long, erect or incurved, flexuous, glabrous or pubescent, ebracteolate or bibracteolate in the lower two-thirds; bracteoles (when present) linear, 1–9 mm long. Hypanthium hemispheric, 4–9 mm long, 8.5–13 mm in diameter, glabrous or pubescent; base rounded or truncate. Calyx lobes subulate, linear triangular, or narrowly triangular, 6–18 mm long, 1.5–3 mm wide, glabrous or pubescent; margin entire. Corolla bilabiate, orange or red on tube, grading to yellow or orange on the lobes, 35–56 mm long, glabrous or sparsely pubescent; tube 18–26 mm long, 8–12 mm in diameter at base, 6–10 mm in diameter at mouth, cylindric or tapering slightly towards mouth; dorsal lobes linear, 20–33 mm long, 2–3 mm wide, recurved, 1/2–3/4 as long as the tube, acute at apex; ventral lip 18–26 mm long, the segments triangular, 1–6 mm long, 0.5–2.5 mm wide, acute at apex. Filament tube 28–40 mm long, 1.2–1.6 mm in diameter, pale yellow or reddish, glabrous; anther tube 3–3.6 mm in diameter, the dorsal surface towards the apex pubescent with white trichomes 0.5–1.5 mm long; dorsal anthers 9–12 mm long; ventral anthers 7.5–9.5 mm long, with tufts of yellowish white trichomes 1.3–2 mm long at apex. Capsules ovoid, 10–15 mm long, 10–12 mm in diameter; seeds oblong or ellipsoid, 0.8–0.9 mm long, 0.3–0.4 mm wide, ca. 0.1 mm thick, the testa minutely reticulate.

Icones.—Wimmer (1953), fig. 103d.

Distribution, habitat, and phenology.—Southwestern Mexico (Guerrero, Oaxaca, and Chiapas) and western Guatemala, on moist slopes and grassy banks in conifer or mixed conifer-deciduous forests at elevations of 1850–3350 m. Flowering from mid-July to late April.

Vernacular Names.—Known as *pitijo* and *coral* in Guatemala (Nash 1976).

Discussion.—This species is very similar to *L. laxiflora* subsp. *laxiflora* but differs in its markedly larger flowers. In Oaxaca, it hybridizes occasionally with *L. ghiesbreghtii* (see below).

Representative specimens. **MEXICO. Guerrero:** 8.5 km NE of Puerto del Gallo, *Barrie & Martínez* 696 (NY, TEX); Cerro Teotepec, *Breedlove* 36079 (MICH); 7 mi al E del entronque Filo de Caballo/Cerro Toro Muerto, *Cowan* 4981 (TEX); 1–2 km E of Cerro Teotepec, *Cruden* 1636 (MICH); Asoleadero, *Feddema* 2852 (MICH, MO, PH); Pie de la Cuesta Toro Muerto, *Hinton et al.* 11081 (K, RSA); Teotepec, *Hinton et al.* 11127 (K, NY, RSA, WTU); 22 km al SO de Higueros, *Koch & Fryxell* 82120 (MEXU, MICH, NY, OSH, TEX, US); 15 km al NE de Puerto del Gallo, *Martínez & Barrie* 5640 (MEXU); 10.8 mi NE of Puerto del Gallo, *Reveal et al.* 4316 (MICH, NY, TEX); 9.4 mi NE of Puerto del Gallo, *Reveal et al.* 4318 (K, MICH, NY, TEX); Cerro Teotepec, *Rzedowski & McVaugh* 227 (ENCB, ISC, MICH), *Rzedowski* 16513 (MICH, NY). **Oaxaca:** N of San José el Pacífico, *Alexander* 700 (MICH). **Chiapas:** Volcan Tacana west, *Matuda* 2893 (F, GH, MEXU, MICH, NY, US).

GUATEMALA. San Marcos: Volcan Tajumulco, *Sharp* 46120 (MICH); entre Serchil y San Marcos, *Smith* 584 (ISC); 6 km N of San Marcos, *Williams et al.* 25890 (NY); near San Andrés, *Williams et al.* 27000 (NY). **Huehuetenango:** 7 mi S of San Juan Ixcay, *Breedlove* 8484 (MICH); between Paquix and San Juan Ixcay, *Molina et al.* 30073 (MO). **Sacatepéquez:** Volcán de Acatenango, *Castillo* 1379 (F); above Santa María de Jesús, *Spooner et al.* 7001 (F). **Solola:** between Huehuetenango and Chimaltenango, *Croat & Hannon* 63506 (NY). **Totonicapán:** Momostenango, *Molina* 21419 (F, NY); La Cumbre de Totonicapán, *Molina & Molina* 25053 (MO); Concordia, *Molina et al.* 31340 (MO); 10–15 km S of Totonicapán, *Williams et al.* 41487 (NY).

4. *Lobelia ghiesbreghtii* Decne., Rev. Hort. (sér. 3) 2:341. 1848; non Lem., Ill. Hort. 1:pl. 34. 1854. TYPE: MEXICO. OAXACA: Oct 1842, *Ghiesbreght* s.n. (HOLOTYPE: P [photographs: MICH! WIS!]; ISOTYPES: G[3]! [photographs: F!]).

Tupa crassicaulis Hook., Bot. Mag. 76:pl. 4505. 1850. TYPE: GREAT BRITAIN: "Hort. Kew" [received from M. Makoy of Liège], *Herb. Hook.* s.n. (HOLOTYPE: K! [photograph: F!]).

Lobelia regalis Fern., Proc. Amer. Acad. Arts. 36:503. 1901. TYPE: MEXICO. OAXACA: Cuicatlan, alt. 550 m, 2 Dec 1895, leg. L. C. Smith, *Conzatti* 105 (LECTOTYPE [designated by McVaugh 1943]: GH! [photograph: F!]).

Stems 2–3 m tall, woody, commonly branched above, erect or ascending, white-tomentose. Leaves petiolate; lamina elliptic, narrowly elliptic, oblong, or narrowly oblong, 9–20 cm long, 3.5–8 cm wide; adaxial surface glabrous or sparsely pubescent; abaxial surface white-tomentose; margin entire or denticulate; apex acuminate; base cuneate; petiole 10–30 mm long, tomentose. Flowers solitary in the axils of the upper leaves or forming a terminal raceme; pedicels 35–64 mm long, ascending, stiff, ebracteolate or bibracteolate at or above the middle; bracteoles (when present) subulate, 0.5–3 mm long. Hypanthium depressed hemispheric, 4–6.5 mm long, 8.5–10 mm in diameter, tomentose; base rounded or truncate. Calyx lobes triangular or deltate, 3.5–6 mm long, 1–3 mm wide, tomentose; margin entire. Corolla bilabiate, yellow suffused with red or all red, 30–40 mm long, tomentose; tube 17–22 mm long, 7.5–8.5 mm in diameter at base, 6–7.5 mm in diameter at mouth, tapering slightly towards mouth; dorsal lobes linear, 12–20 mm long, 1–2 mm wide, about as long as the tube, acute at apex; ventral lip 10–18 mm long, the segments 1.5–6 mm long, 1–2 mm wide,

acute at apex. Filament tube 24–36 mm long, 1.3–1.5 mm in diameter, pale yellow, pubescent; anther tube 2.5–3 mm in diameter, the dorsal surface towards the apex sparsely to moderately pubescent with trichomes ca. 1 mm long; dorsal anthers 7.5–8.5 mm long; ventral anthers 6.5–7 mm long, with tufts of yellow trichomes 1–2 mm long at apex. Capsules broadly ovate, 10–12 mm long, 10–12 mm in diameter; seeds oblong or ellipsoid, 0.5–0.6 mm long, 0.3–0.4 mm wide, ca. 0.1 mm thick, the testa minutely reticulate.

Icones.—Decaisne (1848), fig. 18; Hooker (1850), pl. 4505 [as *Tupa crassicaulis*].

Distribution, habitat, and phenology.—Endemic to Oaxaca, Mexico. Growing on streambanks, in partially shaded loam soil, at 550–2135 m above sea level. Flowering from October to April. Apparently rare, collected but thrice since 1937, in 1960 (King 2482), 1966 (Ernst 2473), and 1974 (Walker 72016).

Cultivation.—This species was introduced to horticulture in the late 1840s (Decaisne 1848, Hooker 1850) but is no longer available.

Discussion.—This species resembles *L. laxiflora* subsp. *laxiflora*, but differs in its dense white tomentum and distinctly petiolate leaves broadest at middle. I have examined a few specimens from Oaxaca that are intermediate in morphology (pubescence, leaf shape and width, petiole length, pedicel length, and flower size) between this species and *L. aguana*, which also occurs in Oaxaca; they are assumed to represent F₁ hybrids. Such specimens have been collected in Juquila (MacDougall 559.S, ENCB, NY; Rzedowski 19533, MEXU, TEX), Miahuatlán (Campos & Peterson 3396, MEXU), and northeast of Sola de Vega (Villasenor et al. 1157, TEX).

Representative specimens. **MEXICO. Oaxaca**: 15 km S of Oaxaca, Camp & Conzatti 2768 (MICH, NY); Cerro del Tule, Conzatti 1777 (BM); Montañas de Mitla, Conzatti & Ostlund 5184 (K); Valle de Tlacolula, Conzatti & Camp 5236 1/2 (MICH, NY); toward Oaxaca from Mitla, Ernst 2473 (MEXU); Javejia, Galeotti 1989 (BR); Oaxaca, Jurgensen 494 (G); 8–10 miles from Oaxaca, King 2482 (MICH, TEX); Oaxaca, Liehmann 7769 (C, W); Rio Tehuantepec below Totolapam, Seler & Seler 1669 (B); between Tlacolula and San Dionisio Chichicapa, Seler & Seler 1673 (B); Tlaxiact Canyon, Walker 72016 (NY).

CULTIVATION. Switzerland: Jardin Bot. de Paternie, 14 Mar 1860, Candolle s.n. (G).

5. *Lobelia decurrens* Cav., Icon. 6:13. 1800; non Roth, Nov. Pl. Sp. 145. 1821.

Rapuntium decurrens (Cav.) C. Presl, Prodr. Monogr. Lobel. 24. 1836. *Tupa decurrens* (Cav.) G. Don in Sweet, Hort. Brit. ed. 3 424. 1839. *Dortmanna decurrens* (Cav.) Kuntze, Rev. Gen. Pl. 2:972. 1891. TYPE: CHILE: In ripis fluminis Claro, Née s.n. (LECTOTYPE, here designated: MA; ISOLECTOTYPES: CONCI FI MAI).

Plants malodorous. Stems 0.8–2 m tall, numerous from the root crown, herbaceous or suffruticose, unbranched, erect or ascending, sparsely pubescent. Leaves sessile; lamina elliptic, narrowly elliptic, narrowly oblong, or oblanceolate, 4–15 cm long, 1.5–2.6 cm wide; adaxial surface glabrous or sparsely pubescent; abaxial surface glabrous or sparsely pubescent; margin biserrate (rarely merely denticulate) with 5–10 falcately triangular acuminate teeth up to 8 mm long per cm; apex acuminate or acute; base long decurrent on stem. Flowers in a ter-

minimal raceme; pedicels 7–14 mm long, erect or ascending, stiff, densely pubescent, ebracteolate (but cf. Sweet 1831). Hypanthium depressed hemispheric, 2.5–5 mm long, 5–7 mm in diameter, pubescent; base rounded or truncate. Calyx lobes linear triangular or narrowly triangular, 7–16 mm long, 1.2–4 mm wide, sparsely to moderately pubescent; margin fimbriate with 3–9 thread-like segments up to 4 mm long per side. Corolla bilabiate or subbilabiate, violet, red-purple, magenta, mauve, or lavender, 22–42 mm long, pubescent at least on the lobes; tube 14–30 mm long, 3–6.5 mm in diameter at base, 2.5–5 mm in diameter at mouth, cylindrical or tapering slightly towards mouth; dorsal lobes narrowly triangular, 8–16 mm long, 2–4 mm wide, straight or somewhat recurved, 1/4–1/2 as long as the tube, acuminate at apex; ventral lip 8–17 mm long, the segments narrowly triangular, 4–14 mm long, 1.5–3 mm wide, acuminate at apex. Filament tube 20–33 mm long, 0.8–1.4 mm in diameter, reddish or purplish, glabrous; anther tube 1.7–2.8 mm in diameter, the surface glabrous (rarely sparsely pubescent toward apex); dorsal anthers 6–8 mm long; ventral anthers 4.8–6 mm long, with tufts of white trichomes 1–1.5 mm long at apex. Capsules ovoid, 10–15 mm long, 7–9 mm in diameter; seeds ellipsoid, 0.5–0.6 mm long, 0.2–0.3 mm in diameter, ca. 0.1 mm thick, the testa faintly striate. Chromosome number $n = 7$ (Diers 1961).

Distribution.—Endemic to Peru. As with *L. cordigera* Cav. (cf. Thompson and Lammers 1997), the supposedly Chilean type locality of *L. decurrens* appears to be an error (Reiche 1905); this is supported by the labels of some of the syntypes (see below). Reports of the species from Ecuador (Wimmer 1937, 1953) are likewise unsubstantiated (Candolle 1839; Jeppesen 1981; Jørgenson 1999).

Vernacular Names.—According to Wimmer (1929), this species is known in various parts of Peru as *contonya*, *contoya*, *contonsa*, and *contunya*. An isotype of var. *jaensis* E. Wimm. (see below) states “peruvianis vulgo *Concho*.”

Ethnobotany.—In Apurimac, this plant is “feared” as a cause of warts (Stork *et al.* 10633). The plant allegedly “exudes a nauseous odor which impedes breathing” (Eycerdam 10755), and is regarded as “venenatissim[us]” and “drastica” (Pavon *s.n.*).

Cultivation.—This species was introduced to horticulture in the 1824 but is no longer available (Sweet 1831; Lindley 1836).

Typification.—In the protologue, *L. decurrens* was said to have been based on plants collected “in regno Chilensi ad ripas fluminis vulgo *Claro* ... Vidi sic. in memorato herbario” [i.e., “Née herbar.”]. At MA are four specimens of this species collected by Née. All match the original description, but only two (MA-475909 and MA-475910) bear locality data matching that cited. However, the former is annotated “Née dedit anno 1804,” making it unlikely that Cavanilles saw it prior to publication. For this reason, the latter sheet is here designated as the lectotype, and the former treated as a duplicate. The other two specimens are of interest in regard to the presumably erroneous locality data of the protologue and lectotype. On MA-475908, the locality is given as “Peru Panama

y Chile" while on MA-475911, it is "nov. Hispania et Peruvia," suggesting early confusion over the provenance of the specimens. These may well be duplicates of the lectotype with variant label data, but it seems best to treat them as separate gatherings.

Discussion.—Candolle (1839) described an unnamed variety of *L. decurrens*, which he denoted as "β" and equated with *L. foliosa* and with Sweet's (1831) and Lindley's (1836) illustrations of *L. decurrens*; Heynhold (1840) provided the name *L. decurrens* var. *foliosa* for it. Candolle characterized this taxon as having "calyce et corollā ubiquē hirsutis," but Wimmer (1929) argued that this differed in no way from typical *L. decurrens*.

Subsequently, Wimmer (1937) described var. *jaensis*, distinguishing it from typical *L. decurrens* (including var. *foliosa*) by its long pubescent (vs. glabrous) stem and leaves and corolla 45 mm (vs. 30 mm) long. He equivocated regarding the latter character, however, noting that "longitudo corollae variat inter 26–45 mm."

My own analysis of morphological variation in *L. decurrens* showed that Wimmer (1937, 1953) was on the right track, but erred in emphasizing pubescence over corolla length. In this study, I detected a pronounced north-south increase in flower size in this species. In the northern part of the range, the corolla is as little as 22 mm long, vs. up to 42 mm long in the south. Most of this increase occurs in the tube, which varies from 14 mm long in the north to 30 mm long in the south. This increase in tube length while lobe length stays relatively constant means that the proportionality of the corolla varies. In the north, the tube is often not much longer than the dorsal lobes; in the south, it can be as much as three times as long. Concomitantly, length of the filament tube varies from 20 mm in the north to 33 mm in the south, though the length of the anthers remains relatively constant. As a result, the filament tube is as little as 2.5 times as long as the dorsal anthers in the north, but up to 4.2 times as long in the south.

As noted above, Wimmer utilized variation in vegetative pubescence to distinguish infraspecific taxa in this species. However, my analysis showed that this variation was not as clear cut geographically as flower size variation. Plants in the north tend to be more densely pubescent than those in the south, but there are many exceptions. This explains Wimmer's statement regarding the extreme variation in corolla length within var. *jaensis*. By emphasizing pubescence, his circumscription encompassed both northern and southern plants; pubescent plants occur in both regions. In a similar vein, the leaves of plants in the north generally are less pronouncedly serrate than those in the south, but again with numerous exceptions.

A morphological continuum such as that seen here in flower size can be difficult to divide meaningfully (Stuessy 1990; Winston 1999). However, there seems to be something of a gap in the variation pattern north of Lima; this is

best seen in the corolla tube and its proportionality to the lobes. North of that *departamento*, corolla tubes are 20–30 mm long and 2.5–3 times longer than the dorsal lobes; from Lima south, they are 14–19 mm long and only 1–1.8 times longer than the dorsal lobes. This gap makes it possible to recognize two subspecies within *L. decurrens*. Other floral characters (see above) show minor overlap in their ranges, but this is to be expected in a case of parapatric geographic subspecies (Raven et al. 1974; Grant 1981; Stuessy 1990).

As noted above, vegetative pubescence and leaf serration are weakly correlated with geography: the northern subspecies tends to be more densely pubescent and less pronouncedly serrate. Additionally, the northern subspecies tends to occur at lower elevations than the southern: 750–2540 m (with one coastal population at 10 m) vs. 2280–3355 m. The phenology of the northern subspecies lags behind the southern by about a month. The single chromosome count for this species (Diers 1961) was made from plants at Matucana in Dpto. Lima and thus pertains to the southern subspecies. The plants introduced to horticulture in 1824 (Sweet 1831; Lindley 1836) appear to have likewise represented the southern subspecies.

The types of *L. decurrens* and of its var. *foliosa* are referable to the southern subspecies, which thus takes the autonym. I originally assumed that the epithet *jaensis* would be available for the northern subspecies, based on the fact that some of the specimens cited by Wimmer in the protologue (i.e., paratypes) were collected in the north and represented that subspecies. However, careful examination of the holotype showed that it represented the southern race. As a result, the northern race is here described as new and christened with an appropriate if unimaginative epithet.

5a. *Lobelia decurrens* subsp. *decurrens*

Lobelia foliosa Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 3:310 (quarto), 242 (folio). 1819 (Nov). *Rapuntium foliosum* (Kunth) C. Presl, Prodr. Monogr. Lobel. 24. 1836. *Lobelia decurrens* var. *foliosa* (Kunth) Heynh., Nom. Bot. Hort. 1:471. 1840. TYPE: "Amerique Equitoriale," Humboldt & Bonpland s.n. (HOLOTYPE: P-Bonpl. [IDC-microfiche]). The protologue states "Regni Quitensis [i.e., Ecuador], juxta pagum Guancabamba;" this seems erroneous in light of subsequent collections.

Lobelia decurrens var. *jaensis* E. Wimmer, in J.F. Macbr., Fl. Peru 6:478. 1937. TYPE: "Perou ou Chile," Pavón s.n. (HOLOTYPE: G; ISOTYPES: CONCI G-BOIS). The G-BOIS isotype, which was not annotated by Wimmer, carries more specific locality data: Peru, Lurini collibus et Chouchin, Ciuchin in siciis callidis, Apr 1829.

Lamina elliptic, narrowly elliptic, or oblanceolate, 4–10 cm long, 1.6–2.6 cm wide; margin teeth up to 8 mm long. Pedicels 8–14 mm long. Hypanthium 2.5–5 mm long, 5–7 mm in diameter. Calyx lobes linear triangular or narrowly triangular, 9–13 mm long, 1.8–4 mm wide; margin fimbriate with 3–6 segments up to 4 mm long per side. Corolla red-purple, violet, or mauve, 31–42 mm long; tube 20–30 mm long, 4–6.5 mm in diameter; dorsal lobes 9–12 mm long, 2.5–4 mm

wide; ventral lip 9–15 mm long, 3–4.5 mm wide, the lobes connate for 1/3–1/2 their length. Filament tube 24–33 mm long, 0.8–1.2 mm in diameter; anther tube 2–2.8 mm in diameter; dorsal anthers 6–8 mm long; ventral anthers 4.8–5.5 mm long, with tufts of white trichomes 1–1.4 mm long at apex. Capsules 2/5–2/3-inferior, 11–15 mm long, 7–8 mm in diameter. Chromosome number $n = 7$ (Diers 1961).

Icones.—Fig. 1A; Cavanilles (1801), pl. 521; Sweet (1831); Lindley (1836).

Distribution, habitat, and phenology.—Endemic to the Andes of southern Peru, from Lima to Arequipa, at elevations of 2280–3355 m, in a wide variety of open to shaded usually mesic environments, including roadsides, fencerows, streamsides, and abandoned fields. Flowering occurs from January to August, and fruiting through October.

Representative specimens. **PERU. Apurimac**: N de Abancay, *Núñez & Vargas* 7232 (MO), Abancay, *Soukup* 707 (F); Abancay (Rio Marino), *Stork, Horton & Vargas* 10633 (F, MO); alrededores de Abancay, *Vargas* 477 (F). **Arequipa**: 22 km S of Arequipa, *Eyerdam & Beetle* 22166 (K, MO), Yura, hills to the east, *Solomon* 2817 (F, MO); Yura, *Stafford* D.46 (K); Yura, *Williams* 2536 (BM, K, NY). **Ayacucho**: Ayacucho to Huancayo, *Balls* 6963 (F, K, US); Ayacucho, May 1867, *Pearce s.n.* (BM, K); Ayacucho, *Soukup* 4012 (US). **Huancavelica**: just below Huaytará on road Pisco – Ayacucho, *Weigend & Förther* 97/625 (F). **Lima**: above Paya, *Asplund* 10802 (US); Tambo Viso, Rio Rimac, *Eyerdam* 10755 (F, NY, US); los baños de Churin, *Ferreyra* 3524 (US); entre Chosica y Matucana, *Ferreyra* 5325 (US); Ayarpongo, cerca de Churin, *Ferreyra* 5358 (US); arriba de Surco, *Ferreyra* 6059 (US); Churin, *Ferreyra* 6174 (US); Surco, *Ferreyra* 7596 (MO, US); Sta. Eulalia, *Goodspeed* 33146 (MO); 2 km W of Matucana, *Hutchinson* 1043 (K, MO, NY, US); Matucana, *Machride & Featherstone* 99 (F, NY); Obrajillo, *US Exploring Expedition s.n.* (US); Rio Chillón near Viscas, *Pennell* 14317 (F, GH, NY); San Bartolomé, *Rose & Rose* 18678 (NY, US); km 75 Central Highway, *Saunders* 370 (BM); Matucana, 22 Apr 1877, *Savatie s.n.* (K); Surco, *Soukup* 3727 (MO, US); Chosica, *Stafford* D.43 (K); just above Matucana, km 80 on the Carretera Central, *Ugent & Ugent* 5299 (US).

CULTIVATION. Great Britain: "... gathered in Chili or Peru by Mr. Miller and raised in 1824." *anonymous s.n.* (K).

5b. *Lobelia decurrens* subsp. *parviflora* Lammers, subsp. nov. TYPE: PERU. PIURA:

Prov. Ayabaca, dry open hillsides, scattered brush, on road to Ayabaca, 18 km above Puente Tandoza (Rio Quiroz). 1700m. 24 Sep 1964, *Hutchinson & Wright* 6687 (HOLOTYPE: NY; ISOTYPES: K! MO!).

Plantae ex Peruvia septentrionali, a reliquo speciei floribus parvioribus cum corolla 22–33 mm long (tubo 14–19 mm longo et lobis 1.1–1.8plo longiori) et filamentorum tubo 20–26 mm longo antheris dorsalibus 2.5–3.6plo longiori distinguenda; plantae plerumque plus pubescentes cum foliis minus serratis.

Lamina narrowly oblong or oblanceolate, 6–15 cm long, 1.5–2.4 cm wide; margin teeth up to 5 mm long. Pedicels 7–12 mm long. Hypanthium 3–5 mm long, 6–7 mm in diameter. Calyx lobes linear triangular, 7–16 mm long, 1.3–2.8 mm wide; margin fimbriate with 3–9 segments up to 3 mm long per side. Corolla red–purple, magenta, or lavender, 22–33 mm long; tube 14–19 mm long, 3–6 mm in diameter; dorsal lobes 8–16 mm long, 2–3 mm wide; ventral lip 8–17 mm long, 4–4.5 mm wide, the lobes connate for 1/2–2/3 their length. Filament tube 20–

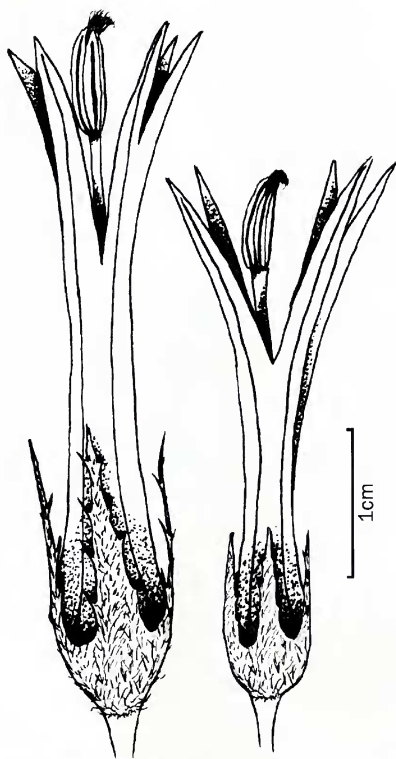


FIG. 1. Flowers of *Lobelia decurrens*. A. *L. decurrens* subsp. *decurrens* (based on Ferreyra 7596, US). B. *L. decurrens* subsp. *parviflora* (based on Mostacero et al. 1725, MO).

26 mm long, 0.9–1.4 mm in diameter; anther tube 1.7–2.5 mm in diameter; dorsal anthers 6.5–8 mm long; ventral anthers 5–6 mm long, with tufts of white trichomes 1.2–1.5 mm long at apex. Capsules 1/3–1/2-inferior, 10–14 mm long, 7–9 mm in diameter.

Icon.—Fig. 1B.

Distribution, habitat, and phenology.—Endemic to the Andes of northern Peru, from Piura to Ancash and Huánuco, typically at elevations of 750–2540 m, in a wide variety of open to shaded usually mesic environments, including roadsides, fencerows, streamsides, and abandoned fields; of note is a specimen collected from dunes in coastal desert at an elevation of just 10 m (*Dillon & Whalen 4009*). Flowering occurs from February to October, and fruiting through November.

Representative specimens. **PERU. Ancash:** ca. 48 km N of Pativilca on PanAmerican Hwy, *Dillon & Whalen 4009* (NY). **Cajamarca:** km 156 E of Olmos, *Hutchinson 1417* (MO, NY), *Hutchinson 1418* (F); Llana, *Laudeman 4159* (K); alrededores de Sécota, *Mostacero et al. 1725* (MO, NY); Casa Blanca (Platanar-Lives), *Sagástegui et al. 8774* (NY); E of Quinden, *Sánchez 3407* (F, MO); Balsas-Celendin road, 16–23 km from Balsas, *Smith 6191* (MO, NY). **Huánuco:** Maria del Valle, *Macbride 3567* (F, NY); Huánuco, *Sawada P.58* (F). **La Libertad:** arriba de Plazapampa (Ruta Salpo-Samne), *Leiva & Leiva 552* (F); abajo de Piedra Gorda (Ruta Salpo-Samne), *Leiva, Paredes & Rodríguez 1202* (F, MO). **Piura:** Abra de Porculla, *Sagástegui, Leiva & Lezama 15067* (F, MO).

6. *Lobelia heteroclita* McVaugh, *Ann. Missouri Bot. Gard.* 52:404. 1965. TYPE: COLOMBIA. BOYACA: Sierra Nevada de Cocuy, Laguna Seca, in more or less cleared area of cloud forest, ca. 2750 m, 18 Aug 1957, *Grubb, Curry & Fernandez-Perez 599* (HOLOTYPE: US; ISOTYPE: K).

Stems 1.5 m tall, herbaceous, apparently unbranched, erect or ascending, pubescent with a mix of short stiff and long lax hairs. Leaves sessile or short-petiolate; lamina broadly elliptic or oblanceolate, 7–10.7 cm long, 2.6–4.5 cm wide; adaxial surface glabrous; abaxial surface with scattered lax hairs 1–1.5 mm long on veins; margin crenate toward apex; apex obtuse or acute; base rounded or cuneate; petiole (when present) up to 0.7 mm long, pubescent. Flowers in a terminal raceme; pedicels 15–23 mm long, ascending, spreading, or slightly incurved, stiff, pubescent with long spreading hairs, ebracteolate or bibracteolate toward base; bracteoles (when present) linear, 1–7 mm long. Hypanthium asymmetrically depressed hemispheric, 2–4 mm long, 6–7 mm in diameter, pubescent; base rounded or truncate, ventrally oblique. Calyx lobes linear triangular, 5–9 mm long, 1.5–2.2 mm wide, sparsely pubescent; margin entire or with 1–2 pairs of minute teeth. Corolla unilabiate, deep pink, 36–47 mm long, glabrous; tube 29–38 mm long, 5–7 mm in diameter at base, 1.5–3 mm at mouth, tapering conspicuously towards mouth, ventrally somewhat gibbous at base; lobes linear, 5–12 mm long, 1.2–1.5 mm wide, deflexed, 1/4–1/3 as long as the tube, acuminate at apex. Filament tube 32–38 mm long, 1–1.4 mm in diameter, pinkish, glabrous; anther tube 2–2.6 mm in diameter, the surface gla-

brous; dorsal anthers 4–5 mm long; ventral anthers 2.8–3.6 mm long, with tufts of white trichomes 0.7–0.9 mm long at apex. Mature capsules and seeds not seen.

Icon.—McVaugh (1965), Fig. 2A.

Distribution, habitat, and phenology.—Endemic to the Cordillera Oriental of north-central Colombia and known only from the type.

Discussion.—McVaugh (1965) did not specify the affinities of his new species, stating only that it seemed referable to subg. *Tupa*. It is unique within the subgenus by virtue of its ventrally oblique hypanthium (Ayers 1986, 1990). However, on the basis of its habit, pedicels shorter than the flowers (making the inflorescence appear spike-like), reduced or absent bracteoles, depressed hemispheric hypanthium, monochromatic corolla, straight corolla tube, and monomorphic corolla lobes, it is best referred to sect. *Homochilus* and seems most closely related to the other exclusively South American member of the section, *L. decurrens*.

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